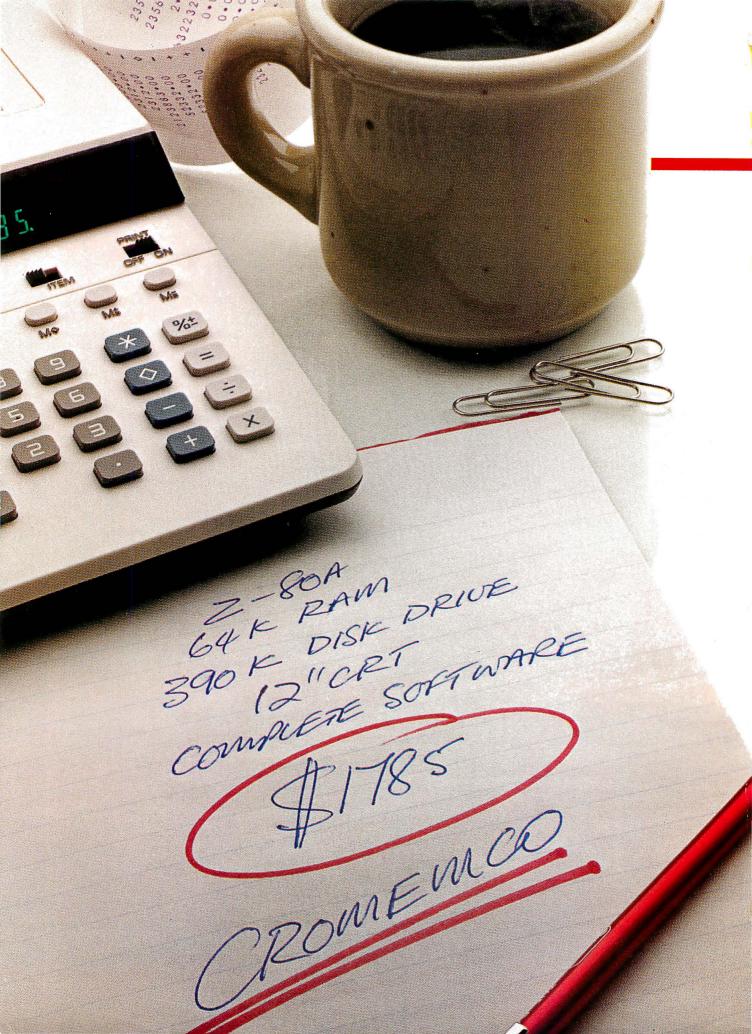
FEBRUARY 1983 Vol. 8, NO. 2 \$2.95 in USA \$3.50 in Canada/£2.10 in U.K. A McGraw-Hill Publication

the small systems journal

Exclusive! Apple Lisa and Ile Reviewed

STANDARDS



How to buy a computer by the numbers.

Introducing the Cromemco C-10 Personal Computer. Only \$1785, including software, and you get more professional features and performance for the price than with any other personal computer on the market. We've got the numbers to prove it.

The C-10 starts with a high-resolution 12" CRT that displays 25 lines with a full 80 characters on each line. Inside is a high-speed Z-80A microprocessor and 64K bytes of on-board memory. Then there's a detached, easy-to-use keyboard and a 5½" disk drive with an exceptionally large 390K capacity.

That's the C-10, and you won't find another ready-to-use personal computer that offers you more.

But hardware can't work alone. That's why every C-10 includes software—word processing, financial spread sheet, investment planning and BASIC. Hard-working, CP/M^R-based software that meets your everyday needs. Software that could cost over \$1000 somewhere else. FREE with the C-10. There's really nothing else to buy.

But the C-10's numbers tell only part of the story. What they don't say is that Cromemco is already known for some of the most reliable

business and scientific computers in the industry. And now for the first time, this technology is available in a personal computer.

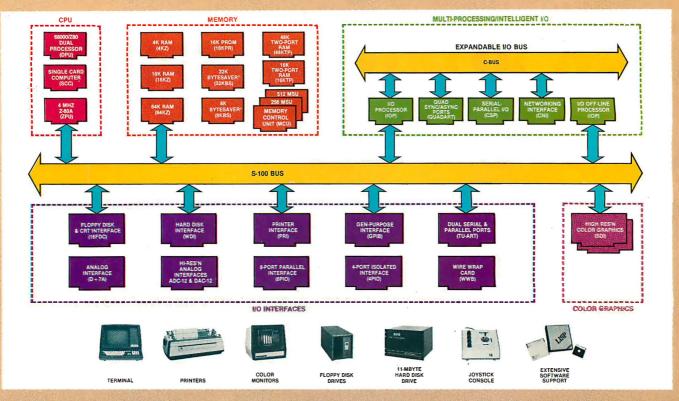
One last number. Call **800 538-8157 x929** for the name of your nearest Cromemco dealer, or to request literature. In California call 800 672-3470 x929. Or write Cromemco, Inc., 280 Bernardo Avenue, P.O. Box 7400, Mountain View, CA 94039.

CP/M^R is a registered trademark of Digital Research, Inc. All Cromemco products are serviced by TRW.



Cromemco
Tomorrow's computers today

Circle 126 on inquiry card.



What Cromemco computer card capability can do for you

The above diagram shows in a functional way one of the most complete lines of computer cards in the industry.

Look it over carefully. It could be well worth your while.

These are all cards that plug into our S-100 bus microcomputers.

You can also assemble them into a custom system in convenient Cromemco card cages.

MULTI-PROCESSING AND INTELLIGENT I/O

The range of capabilities and versatility you can draw upon is enormous.

In processors, for example, you have a choice of CPU's including our extremely useful new I/O Processor. This can be used as a satellite processor to do off-line processing, multi-processing, and to form intelligent I/O. It opens the door to a whole new group of applications and tasks. Ask us about it.

HIGH RESOLUTION COLOR GRAPHICS

Again, you can have beautiful highresolution color graphics with our color graphics interface. You can select from over 4000 colors and have a picture with a resolution at least equal to quality broadcast-TV pictures.



You have an unprecedented selection of memory including our unusual 48K and 16K **two-port** RAMs which allow high-speed color graphics.

LOTS OF STORAGE

These days you often want lots of disk storage. So you can select from our disk controller card which will operate our 5" and 8" floppy disk drives (up to 1.2 megabytes). Or select our WDI interface to operate our 11-megabyte hard disk drives.

POWERFUL SOFTWARE AND PERIPHERAL SUPPORT

There's much more yet you can do with our cards. And, of course, there's an easy way to put them to work in our 8-, 12-, and 21-slot card cages. Our PS8 power supply makes it simple to get the system into operation.

Finally, Cromemco offers you the strongest software support in the industry

with languages like FORTRAN, C, COBOL, ASSEMBLER, LISP, BASIC and others. There is also a wide choice from independent vendors.

To top it all off, you can draw from a substantial array of peripherals: terminals, printers, color monitors and disk drives.

There is even more capability than we're able to describe here.

NOW AT HALL-MARK AND KIERULFF

For your convenience Cromemco products are now available at Hall-Mark Electronics and Kierulff Electronics. Contact these national distributors for immediate product delivery.

CROMEMCO COMPUTER CARDS

PROCESSORS — 4 MHz Z-80 A CPU, single card computer, I/O processor • MEMORY — up to 64K including special 48K and 16K two-port RAMS and our very well known BYTESAVERS® with PROM programming capability • HIGH RESOLUTION COLOR GRAPHICS — our SDI offers up to 754 x 482 pixel resolution. • GENERAL PURPOSE INTERFACES — QUADART four-channel serial communications, TU-ART two-channel parallel and two-channel serial, 8PIO 8-port parallel, 4PIO 4-port isolated parallel, D+7A7-channel D/A and A/D converter, printer interface, floppy disk controller with RS-232 interface and system diagnostics, wire-wrap and extender cards for your development work.



in corporated
280 BERNARDO AVE., MOUNTAIN VIEW, CA 94040 • (415) 964-7400
Tomorrow's computers today

In The Queue

BUTE

Volume 8, Number 2

February 1983

Features

- **33** The Lisa Computer System by Gregg Williams I State-of-the-art hardware and software are combined in this new machine that literally anyone can use
- **54 Build a Handheld LCD Terminal** by Steve Ciarcia *I* A single-line display is quite adequate for many troubleshooting and monitoring applications.
- **68** Apple's Enhanced Computer: The Apple IIe by Robin Moore I For about the same price as the II, the IIe gives you a variety of exciting new features and capabilities.
- **90** An Interview with Wayne Rosing, Bruce Danlels, and Larry Tesler by Chris Morgan, Gregg Williams, and Phil Lemmons I Three key members of Apple's engineering staff discuss the development of the Lisa computer system.
- **118** The Enhanced VIC-20, Part 1: Adding a Reset Switch by Joel Swank I How to add a convenient feature to your VIC-20.
- **130** The World of Standards by Chuck Card, R. Donald Prigge, Josephine L. Walkowicz, and Marjorie F. Hill / The process for producing American National Standards is full of checks and balances.
- **146** Welcome to the Standards Jungle by Ian H. Witten I An in-depth look at the confusing world of computer connections.
- **182** A Proposed Floppy-Disk Format Standard by Chuck Card I A brief description of a proposed format that will allow you to interchange disks from several systems.
- **194** The Proposed ANSI BASIC Standard by Ronald Anderson *I* The committee asks for your opinion.
- **203** NAPLPS: A New Standard for Text and Graphics, Part 1: Introduction, History, and Structure by Jim Fleming and William Frezza I A close look at an important and controversial new communications standard.
- **256** Realizing Graphics Standards for Microcomputers by Fred E. Langhorst and Thomas B. Clarkson III / Use of the Virtual Device Interface graphics system will make portable graphics application software possible.
- **272** The IEEE Standard for the S-100 Bus by Mark Garetz I Standardization helps manufacturers design compatible components independently.

- **314** Problem Oriented Language, Part 3: Assembling the Modules by Mark Finger *I* The final segment of this article describes assembling the modules into a complete programming system.
- **347** User's Column: Confessions, Pascal Prime, Wescon, and Perfect Writer by Jerry Pournelle / Our resident critic comments on Wescon and text editors.
- **392** Shape-Table Graphics for the TRS-80 by Dan Rollins / Draw complex shapes with a single command.
- **452** Passing Untyped Parameters in UCSD Pascal by Eliakim Willner *I* An assembler-language function and a "trick" combine in a parameter-passing method.
- **458** A Terminal Program for the TRS-80 Model III by Ralph L. James I A world of information is just a phone call away.

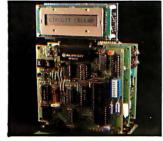
Reviews

302 The Scribble Text Processor by Christopher O. Kern **366** LDOS Utilities by Tim Daneliuk

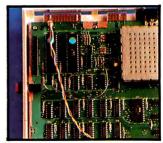
Nucleus

- 6 Editorial: Standards: The Love/Hate Relationship
- 14 Letters
- 28, 127, 370, 433, 441 BYTE's Bits
- **370**, **374** Book Reviews: **6**8000 Assembly Language Programming; A Practical Introduction to Computer Graphics
- **371** Technical Forum: The Magic of the Monte Carlo Method
- **378** System Notes: A High-Resolution Analog-to-Digital Converter for the TRS-80
- 428 BYTELINES
- 434 Event Queue
- 441 Books Received
- 442 Ask BYTE
- 444 Clubs and Newsletters
- **446** Software Received
- 468 What's New?
- **525** Unclassified Ads
- 526 BOMB, BOMB Results
- **527** Reader Service









Page 33 Page 54 Page 68 Page 118



Managing Editor

Mark Haas

Technical Editors

Gregg Williams, Senior Editor; Richard S. Shuford, Curtis P. Feigel, Arthur Little, Stanley Wszola, Pamela Clark, Richard Malloy; Phillip Lemmons, West Coast Editor; Steve Ciarcia, Mark Dahmke, Consulting Editors; Jon Swanson, Drafting Editor

Copy Editors

Beverly Cronin, Chief; Faith Hanson, Warren Williamson, Anthony J. Lockwood, Hilary Selby Polk, Elizabeth Kepner, Nancy Hayes, Cathryn Baskin, Tom McMillan; Margaret Cook, Junior Copy Editor

Assistants

Faith Kluntz, Beverly Jackson, Lisa Jo Steiner

Production

David R. Anderson, Assoc. Director; Patrice Scribner, Jan Muller, Virginia Reardon; Sherry McCarthy, Chief Typographer; Debi Fredericks, Donna Sweeney, Valerie Horn

Advertising

Deborah Porter, Supervisor; Marion Carlson, Rob Hannings, Vicki Reynolds, Cathy A. R. Drew, Lisa Wozmak; Patricia Akerley, Reader Service Coordinator; Wai Chiu Li, Advertising/Production Coordinator; Linda J. Sweeney

Circulation

Gregory Spitzfaden, Manager; Andrew Jackson, Asst. Manager; Agnes E. Perry, Barbara Varnum, Louise Meneaus, Jennifer Price, Sheila A. Bamford: James Bingham, Dealer Sales; Deborah J. Cadwell, Asst; Linda Ryan

Marketing Communications

Horace T. Howland, Director; Wilbur S. Watson, Coordinator; Timothy W. Taussig, Graphic Arts Manager; Michele P. Verville, Research Manager

Controller's Office

Kenneth A. King, Asst. Controller; Mary E. Fluhr, Acct. & D/P Mgr.; Karen Burgess, Jeanne Cilley, Linda Fluhr, Vicki Bennett, L. Bradley Browne, Vern Rockwell

Business Manager

Daniel Rodrigues

Traffic

N. Scott Gagnon, Manager; Scott Jackson, Kathleen Reckart

Receptionist

Jeanann Waters

Publishers

Virginia Londoner, Gordon R. Williamson; John E. Hayes, Associate Publisher; Cheryl A. Hurd, Publisher's Assistant

Officers of McGraw-Hill Publications Company: Paul F. McPherson, President; Executive Vice President: Gene W. Simpson; Senior Vice President-Editorial: Ralph R. Schulz; Vice President-Editorial: Ralph R. Schulz; Vice Presidents: R. Bernard Alexander; Kemp Anderson, Business Systems Development; Shel F. Asen, Manufacturing; Harry L. Brown, Special Markets; Robert B. Doll, Circulation; James E. Hackett, Controller; Eric B. Herr, Planning and Development; H. John Sweger, Jr., Marketing. Officers of the Corporation: Harold W. McGraw Jr., Chairman and Chief Executive Officer; Joseph L. Dionne, President and Chief Operating Officer; Robert N. Landes Senior Vice

Operating Officer; Robert N. Landes, Senior Vice President and Secretary; Ralph J. Webb, Treasurer.



In This Issue

Microcomputer enthusiasts have been eagerly awaiting the release of Apple's new machines, the Lisa and the lle (featured in our cover photo by Mike Blake). Officially announced on January 19, these computers, especially the Lisa, are big news. Rumors have been rife about Apple's new products for quite a while, but now the speculation has come to an end and BYTE features three exclusive articles about them. Gregg Williams writes an in-depth description of "The Lisa Computer System," Robin Moore reviews "Apple's Enhanced Computer: The Apple Ile," and Chris Morgan, Gregg Williams, and Phil Lemmons interview three key members of the Lisa design team.

A boon to microcomputer users and a bane to many manufacturers, standards are a current hot topic within the computer industry. This month we feature several articles on the topic of standards, including "The IEEE Standard for the S-100 Bus" by Mark Garetz, "Realizing Graphics Standards for Microcomputers" by Fred E. Langhorst and Thomas B. Clarkson III, "A Proposed Floppy-Disk Format Standard" by Chuck Card, and part 1 of "NAPLPS: A New Standard for Text and Graphics" by Jim Fleming and William Frezza. Also featured this month: Steve Ciarcia tells how to "Build a Handheld LCD Terminal," Jerry Pournelle writes about "Confessions, Pascal Prime, Wescon, and Perfect Writer." and Joel Swank starts our new series on the Commodore VIC-20.

BYTE is published monthly by McGraw-Hill, Inc., with offices at 70 Main St, Peterborough NH 03458, phone (603) 924-9281. Office hours: Mon-Thur 8:30 AM - 4:30 PM, Friday 8:30 AM - Noon, Eastern Time. Address subscriptions, change of address, USPS Form 3579, and fulfillment questions to BYTE Subscriptions, POB 590, Martinsville NJ 08836. Second class postage paid at Peterborough, N.H. 03458 and additional mailing offices. USPS Publication No. 528890 (ISSN 0360-5280). Postage Paid at Winnipeg, Manitoba. Registration number 9321. Subscriptions are \$21 for one year, \$38 for two years, and \$55 for three years in the USA and its possessions. In Canada and Mexico, \$23 for one year, \$42 for two years, \$61 for three years. \$53 for one year air delivery to Europe. \$37 surface delivery elsewhere. Air delivery to selected areas at additional rates upon request. Single copy price is \$2.95 in the USA and its possessions, \$3.50 in Canada and Mexico, \$4.50 in Europe, and \$5.00 elsewhere. Foreign subscriptions and sales should be remitted in United States funds drawn on a US bank. Printed in United States of America.

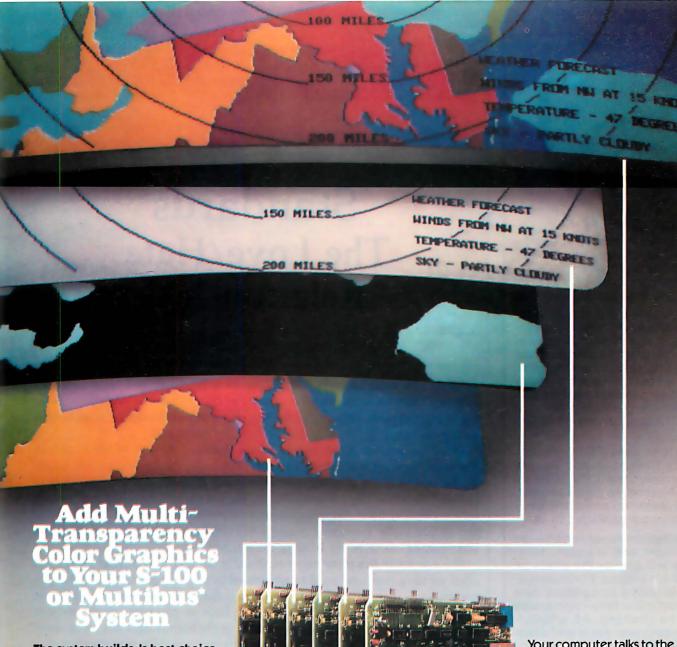
Address all editorial correspondence to the editor at BYTE, POB 372, Hancock NH 03449. Unacceptable manuscripts will be returned if accompanied by sufficient first class postage. Not responsible for lost manuscripts or photos. Opinions expressed by the authors are not necessarily those of BYTE. Entire contents copyright © 1983 by BYTE Publications Inc. All rights reserved. Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center (CCC) to photocopy any article herein for the base fee of \$1.00 per copy of the article of item plus 25 cents per page. Payment should be sent directly to the CCC, 21 Congress St, Salem MA 01970. Copying done for other than personal or internal reference use without the permission of McGraw-Hill is prohibited. Requests for special permission or bulk orders should be addressed to

BYTE® is available in microform from University Microfilms International, 300 N Zeeb Rd, Dept PR, Ann Arbor MI 48106 USA or 18 Bedford Row, Dept PR, London WC1R 4EJ England.

Subscription questions or problems should be addressed to:

BYTE Subscriber Service P.O. Box 328 Hancock, NH 03449





The system builder's best choice for color graphics is a C\$5000 color system from SCION. Its basic component is MicroAngelo®, the single board graphics display computer that has revolutionized monochrome display capability with low cost 512x480 pixel graphics resolution and 40 line by 85 character text capacity.

When MicroAngelo boards are combined, they create high resolution color graphics that have a unique advantage. The displayed image is a combination of transparencies. So you can add, modify or delete images by transparency rather than as an entire image.

SCION's Series CS5000 builds an image with up to 8 bit planes, each generated by a MicroAngelo board. You select the assignment of those bit planes to transparencies. Each transparency can display 2^n -1 colors where n is the number of bit planes it uses... 2 bit planes would make a three color transparency, 8 bit planes would make a 255 color transparency. Once each transparency has been defined, your host can work with it independently, generating and modifying its graphics and text without interacting with the others. The independent transparencies are combined by the Color Mixer board which also assigns one of 16.8 million possible colors to each color of each transparency.

Your computer talks to the SCION Color System in SCREENWARE™, SCION's high level display firmware language. SCREENWARE commands are used by the computer in each MicroAngelo bit plane to generate graphics and text primitives. User interface is made simple with prompted systemset-upusing SCION's ColorPak.

MicroAngelo based color graphics systems are easy to use. Just plug the boards into your Multibus or S-100 host. Or use the freestanding work station configuration with its RS-232 interface. In each case, you get high resolution color graphics for such a low price you can't afford to design your own.

Think SCION for your graphics display needs. Think MicroAngelo. Call us at (703) 476-6100.

System shown is a Model CS5050S. *A trademark of Intel Corp.



if the image is important.

12310 Pinecrest Rd./Reston, VA 22091 (703) 476-6100 TWX: 710-833-0684

MILESTONE® WHEN TIME IS MONEY



As a project manager, you know the value of meticulous planning. Oversights and miscalculations can cost you crucial time and money.

Milestone is a project management and time scheduling program. It is a powerful "critical path" program for planning and analyzing virtually any project, from a cost estimate for a construction project to a schedule for installing a computer system. The applications are unlimited

Milestone uses PERT, Performance Evaluation and Review Technique, and CPM, Critical Path Method, to plan a project, yet Milestone is one of the easiest software packages to use.

The Milestone user can change a variable and instantly Milestone will display the effect on the entire project. For instance, the estimated completion date of a particular time-crucial task may be changed. All scheduling, manpower costs and associated reports will be re-tabulated

TIME IS MONEY. SAVE BOTH WITH MILESTONE.

The price is \$295. CP/M® and CP/M-86[™] versions require 64K and 128K RAM respectively. Manual alone is \$30.

For more information see your local computer dealer or contact Digital Marketing directly.



DIGITAL MARKETING CORPORATION

2670 CHERRY LANE • WALNUT CREEK • CALIFORNIA • 94596 (415) 938-2880 • Telex 17-1852 (DIGMKTG WNCK)

Dealer Inquines Invited Dealers autside California call (501) 442-0864 (oside California call (415) 938-2883

Milestone is a registered trademark of Organic Software. CP/M is a registered trademark of Digital Research,

Inc.
CP/M-86 is a trademark of Digital Research, Inc.

Editorial

Standards The Love/Hate Relationship

Richard S. Shuford, Special Projects Editor

When you begin to study the history of technology, you learn about Eli Whitney's famous demonstration in 1801 of his mechanized process for making interchangeable firearms parts: the first successful attempt at industrial standardization.

Or so he claimed. According to Edwin Battison, director of the American Precision Museum in Windsor, Vermont, Whitney's demonstration was faked. To be sure, some gun parts were interchanged under the watchful eyes of United States War Department officials, but the parts had been specially made for the event by hand. Whitney couldn't deliver on the promises he made, and the 10,000 badly assembled muskets his company delivered (several years later) turned out to be the bane of the infantry.

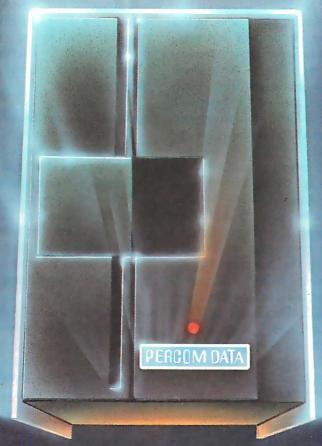
The essence of this story may sound sadly familiar to computer users. Too often we see a computer product advertised as possessing a feature that incorporates some industry standard, but when it comes time to use the feature, we find annoying restrictions. Sometimes we have to pay more to get another feature that supports the standard feature, or the feature does not really work at all in the standard way. Disgruntled souls may conclude that the computer industry follows no standards at all.

Those of us who work with computers have a love/hate relationship with standards. According to Robert Rountree of the National Bureau of Standards, "Computer users love standards; computer manufacturers hate them."

How Standards Emerge

A standard, in theory, represents a consensus of expert opinion on how to perform a given technological function. The standards process, in the words of Dr. John A. N. Lee, vice-chairman of the Standards Committee of the ACM (Association for Computing Machinery), is "putting current technology into systematized form, available to everybody, and it's also developing a consensus in a peer-review process."

Some standards are born casually; others come into being after lengthy, formal give-and-take in carefully appointed committees. Many standards in the computer industry are de facto, that is, they emerged because one person or company invented a way of performing some function that has been near-universally imitated by everyone else in the industry. Other computer standards are devised formally by an accredited standards-making organization or by the government; many of these latter standards are compromises worked out among representatives of parties that originally invented incompatible methods of performing the same function.



We've Got More Than A Fond Attachment For Your ATARI

We've Got A Disk Drive For \$488.

Percom Data Corporation believes your Atari* home computer is more than just fun and games. We believe you should be able to get a single-density, floppy-disk-system for your Atari 400 or 800 at a price that will take you into the future without knocking you into the next galaxy.

Percom Data has been manufacturing disk-drive systems, and other accessories for personal computers since the mid-1970's and is the industry standard to follow when it comes to data separation and system compatibility.

The Percom Data AT-88 combines Percom Data quality and reliability at a price that is not a budget-buster.

The Percom Data AT-88 offers 88 Kbytes (formatted) in single-density, with plugin ease of attachment to your Atari. The AT-88 has integral power supply, "nopatch" to Atari DOS and critical constant speed regulation.

Take advantage of this low introductory price of \$488 by calling Percom Data now to get more information, or the name of an authorized dealer nearby. Call toll-free 1-800-527-1222



Expanding Your Peripheral Vision

DRIVES . NETWORKS . SOFTWARE

11220 Pagemill Road Dallas, Texas 75243 (214) 340-7081 1-800-527-1222 The most tempting approach to standardization is that of the "Lone Ranger." And it works, sometimes. In this approach, one individual, group, or company develops a method for performing a technological function, presents it to the world, and says, "Please do this my way." Occasionally a proposed standard graduates from Lone-Ranger status to general approval and use, but most such attempts languish in obscurity, unless the proposing person or organization has lots of clout, regardless of the technical merits of the proposal.

We find that technical merit often has nothing to do with whether one of several competing technological developments becomes an accepted standard. In standards work, to mix metaphors a bit, a bird in the hand is usually worth the whole ball game. The first product of a given type to achieve widest commercial distribution usually sets the standards. Thus, we have the S-100 bus (now the IEEE 696 bus) derived from the first successful microcomputer, and we have many de facto standards: the IBM 3740 disk format, Digital Research's CP/M-80 operating system, and Microsoft BASIC.

Pure political and financial muscle also helps establish a standard. AT&T will probably overwhelm all competition in videotex encoding with its NAPLPS (North American Presentation-Level-Protocol Syntax), which

was presented to ANSI (American National Standards Institute) on a silver platter for formal acceptance. Even for corporate giants having a bird in the hand helps. IBM will probably have no chance of getting its own graphics/videotex system adopted, simply because NAPLPS got there first.

Forces Hindering Standardization

It's fairly obvious why computer users like standards. Standards make their life easier in thousands of ways. But the reasons standards may be disliked by the people who make computers or peripherals are more obscure.

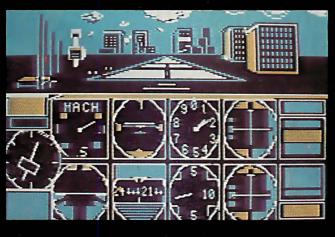
A creative engineer designing a new computer may feel that following a standard specification is too restrictive. And some companies fear that manufacturing standardized products makes for humdrum marketing and lack of attention from potential customers. They want to differentiate their products from what has gone before. Then, too, there are the costs involved in finding out what standards exist and are appropriate for a certain product, in obtaining the technical specifications and enforcing their use during the design phase, and in testing for compliance. Products designed before the standard was developed may prove difficult or prohibitively expensive to adapt. Furthermore, some existing standards were poorly thought out or froze technology before it matured. These and other reasons can discourage manufacturers from complying with standards.

As well, the making of standards themselves has its own problems and costs. Most American National Standards ultimately cost tens or even hundreds of thousands of dollars, either as direct or indirect expenses, to develop and distribute. Standards work is largely done by volunteers, and sometimes obviously useful efforts to develop standards are delayed or abandoned because of manpower shortages.

In addition to economic problems, the politics of decision making by committee and legal obstacles sometimes muddy the waters of standardization. The most dramatic example is the Supreme Court's ruling last year against the American Society of Mechanical Engineers (*Hydrolevel* v. *ASME*) that the Society was liable under antitrust law for abuses by its representative of its own standards-interpretation process. Although the *Hydrolevel* decision hung on the intentional abuse that occurred (it seems unlikely that a standards-making organization would have the same liability if its representatives acted in good faith), the case has caused some review of procedures in other organizations.

Another obstacle is time. The standards-making process is lengthy and slow. The amount of time required by ANSI for public comment and peer review is intended to prevent any abuse of ANSI's standard-making procedures, but it also drags out the process. Some individuals and organizations have tried, with varying degrees of success, different means of avoiding the slow ANSI procedures. One way to avoid having to make an





This total IFR System disk features gobs of menu selectable flight programs each with breath taking realistic picture graphics, moving scenery, airport approaches, holding patterns and much much more.

\$50.00 At your Computer Store or direct from Visa Mastercard

Programmers Software 2110 N. 2nd Street Cabot, Arkansas 72023 (501) 843-2988

Introducing SooperSpooler's[™] Little Brother

Who knows spoolers better than Consolink?*We pioneered this industry with our revolutionary SooperSpooler, the Intelligent Printer Interface.

Now meet the newest family addition: MicroSpooler™

especially designed and engineered for those who need cost-effective solutions to their spooler requirements without sacrificing quality and sophistication.

No More Waiting on the Printer

The new MicroSpooler stores data and then feeds it to a printer as fast as the printer can handle it.

That means no down time: in a matter of seconds, your computer is free for the next job without waiting for the printer to finish the last job.

Quality, Reliability, Flexibility

As with the SooperSpooler, the new MicroSpoolers are the product of the highest engineering standards to insure trouble-free operation. Now Consolink offers a complete line of stand-alone spoolers that can be installed in-line between virtually any printer and any computer.

Easy to install. Easy to use. Easy on the budget.

Features include:

- 16K Memory: User or factory expandable to 32K or 64K
- Multiple Copy Function
- Status Readout: Tells you how much data is stored or how many copies are left to run
- Pause Function: To let you change paper, make adjustments
- · Self-Test Routine: Performs a comprehensive check of most internal functions and memory
- Internal Power Supply: No bulky plug adapters
- Vertical Mount Configuration: Saves desktop space
- Plug-in connections to most computer combinations

- Independently Selectable Baud Rates on Serial Ports
- One Year Limited Warranty**
- Thirty-Day Money Back Guarantee**
- Four Models: Any Combination of Parallel or Serial I/O
- \$199 for 16K parallel to parallel unit with an internal power supply

And When You Need the Very

Remember SooperSpooler, the Intelligent Printer Interface with a remarkable range of software controlled features and formatting capabilities.

See our new MicroSpoolers at quality dealers everywhere. For immediate answers to your questions, call Toll Free 800-525-6705

Spoolers by Consolink— Now you have an Intelligent Choice.

Circle 89 on inquiry card.

CONSOLINK CORPORATION







Without MicroSpooler 21 Minutes

> CPU time for 20 pages† 80 CPS Bidirectional



With MicroSpooler 16 Seconds

CPU time for 20 pages†

For immediate answers to your questions, call Toll Free: 800-525-6705

Consolink Corporation, 1840 Industrial Circle, Dept. ML1-200 Longmont, CO 80501 (303) 652-2014 *Formerly Compulink Corporation

**Consult your dealer or Consolink for details

†60 lines per page, random line lengths, 40 char/line Assumes CPU can output text at a minimum of 3000 char/sec. ANSI standard is to go through the IEEE (Institute of Electrical and Electronics Engineers). Although a member of ANSI, the IEEE has been developing standards on its own authority using its own committee process (sometimes a joint ANSI/IEEE standard emerges). IEEE standards have been well received by the industry, but even these typically take years to gel.

Contributions Are Needed

Are you now asking, "Can something be done to improve the standards process?" Yes, within limits.

Although the computer-standards community at first seems like an intimidating monolith, it is composed, for the most part, of men and women who are sincerely doing what they can to systematize the rapidly changing technology of computing. They possibly could use your help.

You can get involved in several ways. The simplest is to use existing standards in your current work and promote their use among your associates. When buying computer products, favor those that employ industry standards.

If you have expertise in a field where standards are being developed, you should obtain copies of the proposed standards documents during the public-comment period and send your written comments to the appropriate bodies (for a list of addresses, see page 142). If you are a member of a professional society, such as the IEEE or the ACM, you can work though your society, informing members of its standards committees about your preferences and telling them if you think certain new standards need to be made or old ones changed. This is especially important for those of us who work with microcomputers, because many of the members of formal

standards committees have experience only with larger computers.

Better yet, inquire about becoming a member of an appropriate committee. You can join the thousands of people working in the standards process and share their pride in helping to make advanced technology more available to everyone.

References and Periodicals

American National Standards Cover the Wide World of Information Processing: SP X7J. New York: American National Standards Institute. Copies available free from ANSI.

American National Standards Institute Procedures for Management and Coordination of American National Standards. New York: ANSI. Single copies free from ANSI.

Catalog of American National Standards. New York: ANSI, 1982. Catalog of EIA and JEDEC Standards and Engineering Publications. Washington, DC: Electronic Industries Association, 1982.

Folts, Harold C. (ed.) McGraw-Hill's Compilation of Data Communications Standards, Edition II. New York: McGraw-Hill Publications Co., 1982.

Hill, I. D. and B. L. Meek. *Programming Language Standardisation*. New York: Halsted Press, John Wiley & Sons, 1980.

Infocomm Standards. Newsletter of information standards published by Data Communications magazine. McGraw-Hill Publications Co., 1221 Avenue of the Americas, New York, NY 10020.

Morgan, Christopher P. "Can We Agree on Standards?" November 1981 BYTE, page 6.

NBS Publications List 88: The Computer Science and Technology Series. Washington, DC: Institute for Computer Sciences and Technology, National Bureau of Standards, 1982.

NBS Update. Biweekly newsletter of the National Bureau of Standards.

Pittman, Tom. "A Recipe for Standards." April 1982 BYTE, page 26. Prigge, R. Donald, Marjorie F. Hill, and Josephine L. Walkowicz. *The World of EDP Standards*, 3rd ed. Blue Bell, PA: Sperry-Univac, 1978.

From the Publishers

These are exciting times for the microcomputer industry and for BYTE in particular. During 1982 the industry once again exceeded even the most optimistic predictions of economists, and the performance of BYTE exceeded even the most optimistic predictions of its management. Our audited paid circulation was 324,000 by year-end and we know that at least twice as many readers see each issue. The tremendous results that advertisers have obtained by placing their messages in BYTE magazine led to the first ever (according to some publishing industry commentators) 1000-page increase in a single year.

Fortunately, even if we were somewhat conservative in our predictions of BYTE's performance in 1982, we were aggressive in our efforts in maintaining the strength and quality of the BYTE staff. Nowhere is this more evident than in the BYTE editorial department which, of course, is solely responsible for the indisputable fact that BYTE has become the most respected and trusted voice in computer publishing. It is because of our strong staff that we can calmly wish

Editor in Chief Chris Morgan the best of luck as he begins to devote the lion's share of his time to a new software company. Because Chris has planned out a year's worth of theme issues in advance, has guided the selection of specific articles for many months in advance, and has developed an editorial staff that for more than a year has produced editorial content up to the high standards for which BYTE has become famous (all this with Chris on the road much of the time), we can guarantee the continued unstinting editorial excellence you have come to expect in BYTE.

We remain guided by the thought expressed on the occasion of our fifth anniversary in September 1980: "Although the trappings of success are pleasant for us to contemplate, we would be foolish to forget the philosophy that has produced them: giving both readers and advertisers good value for their dollar."

Virginia Londoner Gordon R. Williamson



TOUGH TO OUTGROW

It's no surprise so many businesses today are using our CompuStar* multi-user microcomputer. All sorts of businesses, those at the top and those on the way, know that only CompuStar can give them the big system performance they'll need as they grow. And they know that *only* CompuStar can deliver that performance at a fraction of the cost of most other systems.

CompuStar' solves the small business computer dilemma. It's ideal for those first time business users who need only single-user capability. But it's also perfect when those small businesses grow into large corporations. That's because CompuStar is *truly* expandable... all the way up to 255 workstations, each with its own processor and internal computer memory. And that means fast, fast response, even when many users are on-line at the same time.

Whether you're a small business with big plans or a big business with an eye for economy, CompuStar' has the performance and versatility that's tough to outgrow... the price/performance ratio that's impossible to beat!

'Microsoft is a trademark of Microsoft Corp. (Hepistered trademark of Digital Research

STANDARD FEATURES

- 350K/750K/1.5 MB workstation disk capacities
- 64K RAM and twin processors in each workstation
- An easy-to-read 12-inch non-glare screen
- Operator convenience features numeric keypad and visual text highlighting
- Microsoft* Basic
- CP/M+ operating software
- Truly multi-user and multi-processor

STORAGE OPTIONS

- 10 MB—compact, low-cost and tabletop
- 96 MB-80 fixed and 16 removable megabytes
- 144 MB-reliable, rugged Winchester storage

CompuStar* is built and backed by the company that's been in the microcomputer business as long as microcomputers have been in business. Would you trust your business to anything less? CompuStar! Tough to beat. Tough to outgrow!



GREAT PRICES!

	APPLE HARDWARE
EAT PRICES!	videx VIDEOTERM \$299
	VIdex KEYBOARD ENHANCER. 119
	Microsoft Z-80 SOFTCARD 279
	Microsoft 16K RAMCARD 149
COMPUTERS	
TIMEX \$89	Microsoft PREMIUM PACK 599
	Includes: Z-80 Softcard, 16K
FRANKLIN W/monitor 1098	Ramcard, Videx Videoterm, and
VIC 20 189	CPLM USER GUIDE.
CALIFORNIA	RANA I-163K\$379
COMPUTER SYSTEM CALL!	RANA II-326K 529
INDUST. MICRO SYSTEMS CALL!	RANA III-652K699
MORROW MICRODECISION CALL!	RANA with controller additional 99
MORROW MICROPECIDION OFFEE.	Haves MICROMODEM II 289
PRINTERS	SVA 256K APP-L-CACHE 949
	Mountain MULTI I/O178
Smith Corona TP-1 \$599	Mountain SUPERTALKER 262
C Itoh PROWRITER-P 489	
C Itoh PROWRITER-S 639	M&R SUPERFAN
C Itoh PROWRITER 15" 789	GRAPPLER PLUS125
C Itoh F-10	PKASO135
C Itoh F-10 TRACTOR 229	CCS129
OKIDATA 80	Acynchronous Interface
OKIDATA 00	Synchronous Interface CCS Calendar Clock
OKIDATA 82A	Synchronous Interface
OKIDATA 83A	CCS Calendar Clock
OKIDATA 84A	CCS Printer Interface 129
IDS PRISM 132 1649	
4 color, 200 cps, auto-sheet	IBM ACCESSORIES
feeder, graphics	Quadram 128K RAMCARD 649
IDS PRISM 801149	Quadram 192K RAMCARD 749
IDS PRISM 80	Quadram 192K RAMCARD 749
IDS PRISM 80	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829
IDS MICROPRISM 599 ANADEX 9501 1299	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232,
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock
IDS MICROPRISM 599 ANADEX 9501 1299	Ouadram 192K RAMCARD 749 Ouadram 256K RAMCARD 829 Ouadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399
IDS MICROPRISM	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599
IDS MICROPRISM	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699
IDS MICROPRISM	Ouadram 192K RAMCARD 749 Ouadram 256K RAMCARD 829 Ouadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799
IDS MICROPRISM	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Tandon SGL. SIDED FLOPPY 249
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100 137	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tindon SGL . SIDED FLOPPY 249 Tandon DBL . SIDED FLOPPY 289
IDS MICROPRISM	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Tandon SGL. SIDED FLOPPY 249
IDS MICROPRISM	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tindon SGL . SIDED FLOPPY 249 Tandon DBL . SIDED FLOPPY 289
IDS MICROPRISM	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100G 137 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100G 137 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 599 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA MAXEII MD-1 \$31,25
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100 137 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 799	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA MAXEII MD-1 \$31.25 MAXEII MD-2 47.10
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 99 AMDEK VIDEO 100G 137 AMDEK VIDEO 100G 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 912C 799 TELEVIDEO 912C 868	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA MAXEII MD-1 \$31.25 MAXEII MD-2 47.10 MAXEII FD-1 41.50
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 99 AMDEK VIDEO 1000 137 AMDEK VIDEO 300 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 799 TELEVIDEO 920 868 TELEVIDEO 925 825	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA MAXEII MD-1 \$31.25 MAXEII MD-2 47.10
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 99 AMDEK VIDEO 1000 137 AMDEK VIDEO 1000 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 649 TELEVIDEO 912C 799 TELEVIDEO 92C 868 TELEVIDEO 925 825 TELEVIDEO 950 949	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 99 AMDEK VIDEO 100G 137 AMDEK VIDEO 300 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 912C 799 TELEVIDEO 92C 868 TELEVIDEO 925 825 TELEVIDEO 950 949 CAMES	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 99 AMDEK VIDEO 100G 137 AMDEK VIDEO 300 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 912C 799 TELEVIDEO 92C 868 TELEVIDEO 925 825 TELEVIDEO 950 949 CAMES	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 99 AMDEK VIDEO 100G 137 AMDEK VIDEO 300 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 912C 799 TELEVIDEO 92C 868 TELEVIDEO 925 825 TELEVIDEO 950 949 CAMES	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95 MISC. SOFTWARE MATHEMAGIC \$79
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 1000 137 AMDEK VIDEO 100G 137 AMDEK VIDEO 100G 179 AMDEK VIDEO 100G 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 649 TELEVIDEO 92C 799 TELEVIDEO 92C 868 TELEVIDEO 925 825 TELEVIDEO 950 949 CAMES SPACE CADET \$29 SNACK ATTACK FOR IBM 39	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95 MISC. SOFTWARE MATHEMAGIC 579 GRAPHMAGIC 79
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100 137 AMDEK VIDEO 100 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 649 TELEVIDEO 92C 799 TELEVIDEO 92C 868 TELEVIDEO 92C 868 TELEVIDEO 950 949 CAMES SPACE CADET \$29 SNACK ATTACK FOR IBM 39 NEMESIS 39	Ouadram 192K RAMCARD 749 Ouadram 256K RAMCARD 829 Ouadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95 MISC. SOFTWARE MATHEMAGIC 79 DIAGNOSTICS II 84
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100 137 AMDEK VIDEO 100 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 649 TELEVIDEO 910 868 TELEVIDEO 92C 799 TELEVIDEO 92C 868 TELEVIDEO 950 949 CAMES SPACE CADET \$29 SNACK ATTACK FOR IBM 39 NEMESIS 39 DUNGGON MASTER 39	Quadram 192K RAMCARD 749 Quadram 256K RAMCARD 829 Quadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31,25 Maxell MD-2 47,10 Maxell FD-1 41,50 Maxell FD-2 48,95 MISC. SOFTWARE MATHEMAGIC 79 GRAPHMAGIC 79 DIAGNOSTICS II 84 DISK DOCTOR 84
IDS MICROPRISM 599 ANADEX 9501 1299 MICROFAXER 32K S-S 229 MICROFAZER 32K P-P 199 TERMINALS & MONITORS ADDS VIEWPOINT \$559 AMDEK VIDEO 100 99 AMDEK VIDEO 100 137 AMDEK VIDEO 100 179 AMDEK VIDEO 300 179 AMDEK COLOR I 399 AMDEK COLOR I 719 TELEVIDEO 910 649 TELEVIDEO 910 649 TELEVIDEO 92C 799 TELEVIDEO 92C 868 TELEVIDEO 92C 868 TELEVIDEO 950 949 CAMES SPACE CADET \$29 SNACK ATTACK FOR IBM 39 NEMESIS 39	Ouadram 192K RAMCARD 749 Ouadram 256K RAMCARD 829 Ouadram Includes RS232, parallel port, real time clock Microsoft 64K RAMCARD 399 Microsoft 64K RAMCARD 599 Microsoft 192K RAMCARD 699 Microsoft 256K RAMCARD 799 Tandon SGL. SIDED FLOPPY 249 Tandon DBL. SIDED FLOPPY 289 Davong HARD DISK SYSTEM 1599 MEDIA Maxell MD-1 \$31.25 Maxell MD-2 47.10 Maxell FD-1 41.50 Maxell FD-2 48.95 MISC. SOFTWARE MATHEMAGIC 79 DIAGNOSTICS II 84

APPLE HARDWARE

CALL TOLL-FREE 1-800-523-9511 IN PENNSYLVANIA 1-215-868-8219

WORDPROCESSING

WORDSTAR	S279
MAILMERGE	
SPELLSTAR	144
PERFECT WRITER	
PERFECT SPELLER	
WORD HANDLER	
SPELLBINDER	
SPELLGUARD	
EASYWRITER II	
EASYSPELLER	
PIEWRITER	
WORD PLUS	
MATHSTAR	99
	ATA BASE
84881	

MANAGEMENT \$520

abase III	4050
PERFECT FILER	. 279
EASYFILER	. 349
FMS 80	. 750
TIM III	399
FAST GRAPH	189
THE ANSWER	219
OUICKCODE	
dUTIL	68
D GRAPH	239
DATASTAR	171
SUPERSORT	
VISIFILE	
VISIDEX	

4DACE II

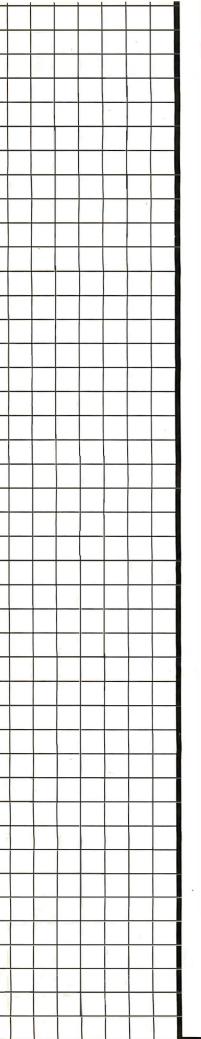
FINANCIAL SOFTWARE

EAGLE MONEY DECISIONS.	\$119
SUPERCALC	189
PLANNER CALC	69
MASTER PLANNER	249
MULTIPLAN	219
PERFECT CALC	139
VISICORP VISICALC	184
DEKTOP PLAN	184
VISISCHEDULE	. 228
VISITREND/PLOT	228
SCRATCHPAD	259
STATSGRAPH	. 169
ACCOUNTING SOFTW	ARE

ACCOUNTING SOFT WAKE
ACCOUNTING PLUS \$385
ACCOUNTING PLUS II 299
For Apple II
EASY EXECU. ACCOUNTING . 579
TCS
THE HOME ACCOUNTANT 129
IUS-IBM ACCT. SYS CALL

LANGUAGES

Microsoft BASIC COMPILER \$	299
Microsoft BASIC INTERPRETER	
Microsoft FORTRAN 80	
Microsoft COBOL 80	559
Microsoft muSIMP / muMATH.	199
Microsoft TASC	149
Supersoft ADA	269
Supersoft FORTH	149
Supersoft A. L. D. S	. 99
Supersoft FORTRAN/RATFOR	
sorcim PASCAL M	129
Whitesmith's C	
Whitesmith's PASCAL	850



NEW PRODUCTS!

INFOSTAR
MICROPRO
MICROPRO'S DATABASE MANAGEMENT SYSTEM NOT ONLY COMBINES THE ALREADY
RENOWNED FEATURES OF DATASTAR AND SUPERSORT BUT ALSO FEATURES A REPORT
GENERATOR. THIS MEANS YOU CAN ENTER, SORT, RETRIEVE, ORGANIZE, AND PRINT DATA
QUICKLY AND EASILY...AND WITH NO NEED TO PROGRAM! BUT THAT'S NOT ALL...YOU CAN
EDIT YOUR REPORTS WITH WORDSTAR, THE WORLD'S NO. 1 SELLING WORDPROCESSOR.
LIST PRICE: \$495.00
MICROHOUSE PRICE: CALL

T/MAKER III

T/MAKER COMPANY
WITH THE T/MAKER III YOU CAN EDIT YOUR TEXT, COMPUTE YOUR NUMBERS, TALLY YOUR
RESULTS, AND PRODUCE FINISHED REPORTS EVEN IF YOU WANT IT ALL IN ONE FILE!
T/MAKER III ALLOWS BAR CHARTING FROM A FULL ELECTRONIC SPREAD SHEET.

RANDOM HOUSE ELECTRONIC THESAURUS

THE RANDOM HOUSE ELECTRONIC THESAURUS IS THE FIRST REFERENCE SOFTWARE THAT ALLOWS YOU TO DO "IDEA PROCESSING" WITHIN YOUR WORD PROCESSOR BASED ON THE POPULAR RANDOM HOUSE THESAURUS. IMPROVES YOUR WRITING SKILLS BY FINDING THE RIGHT WORD YOU NEED AND INSERTING IT IN THE TEXT.

The 60,000 SYNONYM VERSION REQUIRES 204K. ABRIDGED VERSIONS AVAILABLE FOR 80K and 125K

RANDOM HOUSE ELECTRONIC PROOFREADER

PROOFREADER ALLOWS ACCESS TO THE RANDOM HOUSE DICTIONARY WITH FULL INTERACTIVE CORRECTION TO CHECK ALL YOUR SPELLING ERRORS. IBM VERSIONS ALLOW ACCESS UP TO 32,000 AVAILABLE WORDS.

MICROHOUSE PRICE: \$50.00

GRAPHMAGIC
GRAPHMAGIC ALLOWS YOU TO DRAW VISUAL REPRESENTATIONS OF GRAMS AND LINE GRAPHS FROM SPREAD SHEET PROGRAMS INCLUDING MATHEMAGIC, SUPERCALC OR VISICALC.

LIST PRICE: \$99.00 MICROHOUSE PRICE: \$79.00

C. ITOH 1550 C. ITOH ANOTHER NEW PRINTER FROM C. ITOH WITH THE SAME GREAT QUALITIES AS ALWAYS BUT INTRODUCING A NEW WIDER CARRIAGE THAT CAN ACCOMMODATE PAPER SIZES UP TO 15" (132 COLUMNS). AVAILABLE IN BOTH SERIAL OR PARALLEL VERSIONS.

WORDSTAR, DATASTAR, SUPERSORT, INFOSTAR ARE TRADEMARKS OF MICROPRO, INC. RANDOM HOUSE IS A REGISTERED TRADEMARK OF RANDOM HOUSE, INC. THE RANDOM HOUSE ELECTRONIC THESAURUS IS A TRADEMARK OF RANDOM HOUSE, INC., DICTRONICS PUBLISHING INC. EXCLUSIVE LICENSEE. TP-1 KS A TRADEMARK OF SCM, INC. IBM IS A REGISTERED TRADEMARK OF INTERNATIONAL BUSINESS MACHINES.

Prices may vary with different formats. All prices and specifications are subject to change without notice. Please call or write for specifics.

MICROLINE:

LIST PRICE: \$875.00

MICROHOUSE OFFERS 24 HOUR COMPUTER SHOPPING WITH MICROLINE. MICROLINE IS A COMPUTERIZED ORDER-ENTRY SYSTEM THAT ENABLES YOU TO ACCESS SPECIFIC INFORMATION ON OVER 1000 MICROCOMPUTING HARDWARE AND SOFTWARE PRODUCTS, IN ADDITION TO NUMEROUS SUPPLIES AND ACCESSORIES.*

1-215-868-1230

MICROLINE OPERATES AT 300 BAUD, 8 BITS, NO PARITY, 1 STOP BIT.

PRICES MAY VARY WITH DIFFERENT FORMATS. ALL PRICES AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. PLEASE CALL OR WRITE FOR SPECIFICS.

1444 LINDEN ST./BOX 499 BETHLEHEM, PA 18016

DEALERS INQUIRIES WELCOME

Circle 272 on inquiry card.

WE WANT YOU TO KNOW ...

MICROHOUSE

Letters

For the Record

Peter Callamaras's review of our Executive Briefing System (November 1982 BYTE, page 164) was greatly appreciated here at Lotus. However, the article was incorrect in the At a Glance section, which listed Mitchell Kapor as the author of EBS.

While Mitchell designed the program and supervised its implementation, EBS was coded by Todd Agulnick, a 15-year-old resident of Newton, Massachusetts. Todd was first employed by Mitchell at the age of 12, and he continues to be a source of inspiration for all of us here at Lotus. His great skill and intellect are appreciated almost as much as his fine sense of humor.

Mary Lynn Davis, Graphics Project Manager Lotus Development Corp. 55 Wheeler St. Cambridge, MA 02139

More on BASIC Standards

I read with interest Howard G. Drake's letter dealing with the current and proposed standards for BASIC (October 1982 BYTE, page 18) and wish to comment on two points raised in the letter.

First, the requirement to have DIM statements preceding their use in line-numbered sequence is not new. It has been in the ANSI (American National Standards Institute) Minimal BASIC Standard since the approval of that standard in January of 1978.

The requirement to recognize the existence of DIM statements in linenumbered sequence (rather than in logical sequence) stems from the desire to have the one BASIC program give the same result when that program is run under two implementations, one of which is an interpreter and the other a compiler.

Another point raised by Mr. Drake concerned the need for the interpreter to do a pre-scan in order to recognize the presence of DIM statements.

The X3J2 BASIC Committee was very careful to assure that a pre-scan was *not* required. The suggested technique when a forward transfer-of-control is indicated (as in Mr. Drake's example) is to examine the statements passed over "at the time that they are passed over," to see if they

include any of the statements that must appear in line-numbered sequence prior to their use. These statements include the DIM statement, as well as any OPTION statements (OPTION BASE, OPTION ARITHMETIC, etc.), and any function-definitions.

By taking this approach, BASIC processors need only look at those statements up to and including the one being referenced and need not do a pre-scan of the entire program.

I heartily agree that any interested parties should obtain a copy of the Proposed ANSI BASIC Standard, read it, and comment on it, if they find anything that they believe should be changed.

M. O. Duke IBM Santa Teresa Laboratory 555 Bailey Ave. San Jose, CA 95150

Credit Where It's Due

I recently saw the October 1982 BYTE editorial in which Chris Morgan described videotex and teletext. I'd like to correct one statement regarding closed-captioning. The three networks broadcasting closed-captioned programs are PBS, NBC, and ABC; not CBS. CBS has steadfastly refused to provide captions on its programs for the benefit of hearing-impaired people.

Your omission of ABC is most unfortunate because that network was instrumental in the development of the closed-captioning technology. It leads the way in providing closed-captioning services. For example, ABC recently added closed captions to all broadcasts of ABC's "World News Tonight."

Jane Edmondson, Director Products Promotion and Public Relations National Captioning Institute 5203 Leesburg Pike, Suite 1500 Falls Church, VA 22041

This Thing Called NAPLPS

With regard to Chris Morgan's editorial discussing "This Thing Called Videotex" ("Some Answers to Frequently Asked Questions," October 1982 BYTE, page 10), let me respond with one definition of what videotex is today.

The North American Presentation Level

Protocol Syntax (NAPLPS) allows text and graphics to be encoded in a manner independent of the display apparatus on which it will be presented. Virtually any micro-, mini-, or mainframe computer can be configured to generate NAPLPS pages, and any communications medium—whether it be telephone, broadcast, cable television, microwave, or satellite transmission—can be used.

What does this mean to microcomputer users today? Throughout North America microcomputers from virtually any manufacturer have a common format for text and color graphics that can be communicated universally. NAPLPS is a simple, highly efficient and economical color graphics generator in combination with a decoder. Here are some examples of what is being accomplished today:

- •Users of Hewlett-Packard 80 Series, Commodore PET, and other microcomputers are now being offered a colorgraphics program for Visicalc. The software digests raw Visicalc data files and automatically draws color charts and graphs including exploded pie charts.
- •IBM Personal Computer users can obtain an electronic slide show program that simulates the 35-millimeter slide carousel but has additional features such as random-access retrieval of individual slides and the synchronizing of a sound track for a full audio-visual presentation. These slides can be displayed on a color monitor or even a large screen using a video projector.
- North Star computers are being used as hosts to drive large screen displays of electronic billboard advertising in shopping malls.

Other microcomputers are incorporating color graphics into computer-aided learning courseware and public-access market-research terminals, and marketing presentations are being prepared and, through the decoder, transferred onto video tapes.

Hard-copy service bureaus will soon be available that will provide any page creator the capability to download NAPLPS-encoded pages by telephone and have 35-millimeter slides, overhead transparencies, and other film media produced for them overnight and delivered the next day. Furthermore, paper hard copy is obtainable with the use of jet ink plotters—ideal for charts and graphs that



THE MOST ADVANCED PRINTER IN ITS CLASS.

Good news for microsystem and personal computer users! MPI offers four wide carriage printers with excellence in price and performance. The two 'A' versions of PrintMate^{TN} 150 feature a factory installed 'SoftSwitchTN'' front panel keypad, with a 4K buffer on PrintMateTM 150 model A1 and a 16K buffer on model A2. PrintMate^{TN} 150 models B1 and B2 are factory equipped with a 2K and 16K buffer, respectively. PrintMateTM 150 models have an exceptional set of outstanding graphics and font capabilities, optional expansion, and other advanced features that differentiate the PrintMate TM 150 from its competitive rivals as the superior performer. A bold claim? The strong and widespread acceptance of the excellent Print/MateTM 150 is based on outstanding user features:

HIGH SYSTEM THRUPUT - 150 characters per second advanced logic seeking impact printing with an accelerated print head slew rate and turnaround makes PrintMateT 150 a high speed performer.

WIDE CARRIAGE VERSATILITY—The Print-Mate^{T1} 150's wide carriage can accommodate print lines from 136 to 231 characters in length and can easily handle forms from 3 to 15 inches wide and as long as 31 inches.

LARGE SELECTION OF PRINT CAPABILITIES

The 7x9 dot matrix allows user selection

of 10, 12, 15 or 17 characters per inch or the 11x9 serif font provides document quality printing at 10 characters per inch "SoftSwitch"" FRONT PANEL CONTROL The PrintMateTM 150 A models have Soft-SwitchTill front panel keypads for externally changing forms length, print density, horizontal and vertical tabs, baud rate and character set. A simple 'SoftSwitchTM'' er will display the operating mode you have selected and PrintMate^{TN} 150 responds to every entry with a pleasant tone of confirmation. With the "SoftSwitch"", you can turn off the printer—even unplug it—and Print-MateTM 150 will retain every detail in its non-volatile memory. The "SoftSwitch" may be added to the PrintMate^{TN} B models. EXPANDABLE PRINT BUFFER—PrintMateTA 150 models A2 and B2 have a factory installed 16K buffer. Both the 4K buffer model A1 and the standard 2K buffer model B1 are optionally expanded in increments to 16K. The PrintMateTM 150's expanded buffer allows application extensions for high speed interleaved printing and spooling, greatly improving the host computer's performance in applications that are print bound. DOWNLINE LOADABLE FONTS—The powerful microprocessor based command set of the PrintMateTM 150 allows a custom character set to be developed in the host computer and downloaded to any Print-

Mate^{TN} 150 model with a 4K or larger buffer. GRAPHICS -The standard graphics capabilities of all PrintMate™ 150 models allow printing of up to 6,120 individually addressable dots per square inch giving exceptional resolution for graphics and special characters. PrintMateTM APPLICATIONS PACKAGES— Turn-key graphics and display fonts can be implemented with an extensive line of MPI supported and maintained AP-PAKTN applications packages providing specialized fonts, custom graphs, tables, and picture graphics. Specialized characters such as logos may be easily defined and edited for printing directly from your computer.

CONSIDER THE FEATURES—Only Print-MateTM 150 offers so many ways to get your message across: graphics; display fonts; downline loadable character sets; high print speed; advanced logic seeking; 15 inch wide carriage; a variety of forms and paper capabilities and; friendly "SoftSwitch" inter-action. The PrintMate" 150 is the responsive performer that perfectly mates with your microsystem or personal computer. With prices beginning at \$995, it is evident that the PrintMateTN 150 is the superior performer in function and price.



Micro Peripherals, Inc. 4426 South Century Drive Salt Lake City, UT 84107

Phone 1-800-821-8848

Circle 291 on inquiry card.

need to be inserted into textual reports.

Because NAPLPS is display-resolution insensitive, these same files, although created at a lower resolution, can be redisplayed through a higher-resolution decoder with no modification to the original file. The hard copy, whether film or paper, becomes a higher-quality image. Additionally, broadcast-quality graphics and NTSC- (National Television System Committee) standard video tapes are being used by broadcasters to augment their

graphics requirements. Even audio-visual producers are using this same method to bring down the costs of their productions while preserving the quality.

What other color-graphics system can provide a universal communications coding format for virtually any microcomputer? What other color-graphics protocol specification is in the public domain? What other color-graphics display generator (decoder) has a choice of over 32,000 colors, 16 of which are displayable

simultaneously, among a host of other features? What other color-graphics system can boast the use of a conventional color television as a display monitor and can be purchased for a price starting at \$11007

Only decoders implementing full NAPLPS can satisfy these features and others. With this capability now within the reach of the majority of microcomputers, the challenge of creative, interactive graphics software lies with all microcomputer users, whether they be hobbyists or professional programmers. The challenge is here today at a price competitors can really only dream about.

Zal Press, Manager Business Graphics Marketing Group Norpak Ltd. 1351 Washington Blvd., Suite 3000 Stamford, CT 06902

In Defense of User Protection

In the last year I have read several articles regarding software piracy. Due to this piracy, the creators of software are becoming more and more reticent about making available the source documents and code for a program.

Their caution is well placed because of the wholesale program theft that has taken place in some instances. Then, too, it's possible that the creator stole some major part of the program from someone else, and the lack of an available source listing prevents anyone from proving it.

Before we get too far down the road to complete nonavailability of source code, may I propose some protection for the legitimate user?

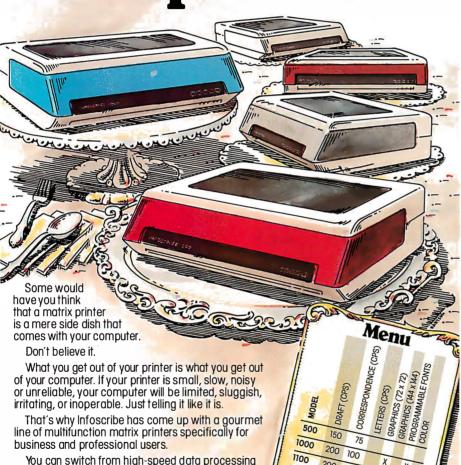
First, companies can and do go out of business every day. While one software creator may not, another may. Without the source code to update the program for system and language enhancements yet to come, that program will become worthless and be lost.

Second, because of market conditions, a developer may cease to offer the software or cease to update it. As a result, the software eventually becomes worthless without source to allow the updating of it.

Third, the program offered may have been almost worthless to start with due to errors. The developer made a fast buck, and the buyer was taken. At least with source, some corrections can be made.

A fourth reason for some user protection is that a successful creator may decide





You can switch from high-speed data processing to business letters, at will; handle up to 16-inchwide paper; make up to five crisp carbons; generate gorgeous graphics in up to eight colors; and enjoy truly elegant and incredibly quiet operation, day-in and day-out.

Check the menu for the printer that meets your exact needs. Why go with the computer manufacturer's combo plate when the same money will let you buy Infoscribe, a la carte?

Your favorite computer dealer or systems specialist will be delighted to arrange a demonstration for you. Or contact the *matrix d'*: Infoscribe, 2720 South Croddy Way, Santa Ana, California 92704, USA, Phone (714) 641-8595, Telex 692422.

PRINT WITH INFOSCRIBE

TIME-PROVEN PERFORMANCE



While new printers with impressive specifications are introduced on an almost daily basis, only time will tell the true quality of the product. Over the past 2 years our customers have continued to buy the DS180 printer, not only because of its impressive performance and competitive price, but also because of our outstanding track record for product reliability and customer support.

We have continually improved on the performance of the DS180 by incorporating such enhancements as dot addressable graphics, 6 user-selectable print sizes and a 2000 character buffer. These features coupled with 180 cps printing, parallel and serial interfaces, adjustable tractor feed and over 40 other programmable features, make the DS180 one of the most versatile matrix printers available today.

Before you select your next printer, why not take a look at a time-proven performer—the Datasouth DS180.

The DS180 printer is available nationwide through our network of sales/service distributors.

datasouth computer corporation

Circle 143 on inquiry card.

P.O. Box 240947 • Charlotte, NC 28224 • 704/523-8500 Telex: 6843018 DASOU UW

that creation is what he is good at and he'd rather not be bothered by support, sales, etc., and so he enters into a royalty agreement for the program with an independent dealer. Now suppose this dealer wants to sell packages but not help you, the buyer, recover from a system crash or a program bug. Without source or even data on file structures being available, you have to start over after every crash.

There is a way out of this morass of uncertainty, and that is an industry-wide uniform software trust agreement, enforced by a trade journal's refusal to accept advertising of software unless the creator or vendor has placed the source code in trust with an independent third party who holds both the names of the legitimate licensees and the latest source files and documentation.

Vendors should be responsible for pro-

viding copies of all user licenses and regularly update the source code on file with the trustee. In return, the trustee agrees to hold source documentation inviolate (sealed) unless a vendor commits certain acts (I'll discuss these acts later on). Thus, protection exists for the vendors (in that the source is still protected) and for the legitimate user as well.

To the legitimate user, source becomes available, for a fee, in the event that the vendor ceases to function.

The trustee has these responsibilities: (1) to hold source code and related documentation sealed and inviolate unless certain acts are committed, (2) to notify only licensed users at their last known address by first class mail as to the acts committed, and (3) to provide to the licensed users only, for a fee related to the reproduction cost, the source code and documentation, when permissible.

What are these vendor acts and subsequent trustee actions? First, in the event of total sale of program rights to another vendor, the trustee should notify licensees of the event and the name and address of the buyer who has assumed the support obligation. In the event of adjudgment of the developer as bankrupt, ceasing of the vendor to do business, decision by the vendor to cease to offer support, or sale of program rights without an obligation to assume existing package support, the trustee shall so notify licensed users and make available for one year source and documentation for a fee.

There remains the question of users who find program vendors/creators either unwilling or unable to provide adequate support for their packages to licensed users. For this some mechanism should allow licensed users to petition the trustee if they feel that a vendor is providing inadequate support. If some threshold level (say 5 percent) of the licensed users of a program complain to the trustee of inadequate service, the trustee should be required to notify all licensees that complaints have been received. If the trustee gets a positive response from a majority of the users that such is the case, the trustee should then provide source code and documentation to users for a fee.

Such an agreement can adequately protect vendors as long as they want to be protected and will probably protect the user for longer than the economic life of the package.

Whatever methodology is created to protect both the user and the creator, total and permanent unavailability of source to

★ ★ ★ FEATURING 8 AND 16 BIT SYSTEMS ★

EPSON QX VALDOCS: Extremely user friendly! See review Sept. BYTE. HX 80: Notebook-sized battery operated Z 80 computer, up to 256 K RAM, built-in hard copy, LCD scrollable screen.

Options: double sided drives, Winchester, TURBODOS, 2 user, 220v/50hz.

IMS 8X MULTIUSER SYSTEMS: Z-80, S-100. Each user has own Z-80, 64K RAM, 2 I/O. TURBODOS multiuser CP/M compatible operating system cuts link/edit time in half. Z-80 code. Interrupt driven. 8088 upgrade w/256K RAM has been announced.

TARBELL: Empire systems, Z-80, S-100.

8088: COLUMBIA DATA: IBM-PC look alike, multiuser option.

8086 S-100 SYSTEMS:

LOMAS: with MS-DOS or CP/M-86. Winchester option. SEATTLE: with simultaneous 8" and 5" drives. Will accept IBM/PC software.

DUAL PROCESSOR SYSTEMS:

GODBOUT 816 A,B,C: 8085/8088. MP/M 816 allows simultaneous operation of both processors.

CROMEMCO DPU: 68000 and Z 80. CROMIX operating system.

MAX BOX 8" DRIVE SUBSYSTEMS w/QUMES, SHUGARTS, MITSUBISHI, NEC.

PRINTERS (dot matrix and LQ): EPSON, NEC, QUME, C.ITOH, IDS, FLORIDA DATA, TELETYPE.

TERMINALS: WYSE, HAZELTINE, IBM 3101, TELEVIDEO.

Voice recognition board for TELEVIDEO 950.

PER SCI 277/299 DRIVES.

MODEMS: U.S. ROBOTICS 1200/300 DC HAYES compatible...... \$525.

S-100 MAINFRAMES:

PARADYNAMICS, ECT, some TEI 12 slot still in stock.

GRAPHICS:

MICROANGELO GRAPHICS. MIRAGE: new from SCION.

AUTO-CAD Interactive graphics software; for engineers, architects, designers. OWENS ASSCCIATES

D. OWENS ASSOCIA

HOUSTON INSTRUMENTS

PLOTTERS, DMP-29 \$1,775.

IBM PC ACCESSORIES: Extensive line including QUADRAM, SEATTLE, 8080/8086 EMULATOR (software).

IBM 3270: compatible equipment from Teletype Corp. Fast delivery! Cost effective!

We have an extensive product line including systems, peripherals, software, boards, drives, consulting services. Write or call for detailed specifications.

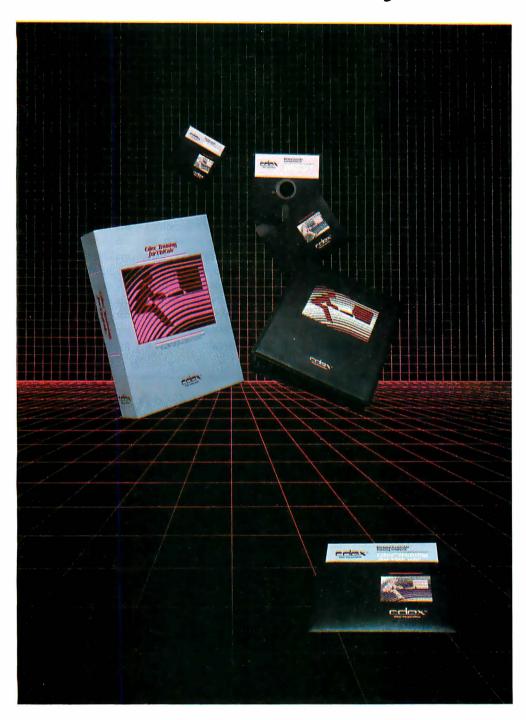
We have knowledgeable technical staff.

WE EXPORT Overseas Callers: Phone (212) 448-6298
TWX 710 588 2844 or Cable: OWENSASSOC

JOHN D. OWENS Associates, Inc.

12 Schubert Street, Staten Island, New York 10305 (212) 448-6283 (212) 448-2913 (212) 448-6298

Cdex™ Training for VisiCalc® Makes VisiCalc Easy.



In an hour, Cdex Training for VisiCalc can make you a VisiCalc user. Or for the experienced VisiCalc user Cdex Training for VisiCalc acts as an instantaneous electronic reference and review system.

It's a computer-assisted training program that works. It's highly interactive. So it creates a dialogue with you and serves as your personal tutor. It's completely self-paced. So you set your own learning time. And it's graphically-oriented. So you see what you're learning. Remember, a picture is worth 1000 words. Cdex Training for VisiCalc runs on the same Apple® II or IBM® Personal Computer as your VisiCalc program.

So see how easy VisiCalc can be. See your nearest computer dealer for a demonstration.

Cdex™ Training for VisiCalc®

We don't make VisiCalc. We just make it easy.



5050 El Camino Real Suite 200 Los Altos, CA 94022

VisiCalc® is a registered trademark of VisiCorp™

a legitimate user is not an acceptable answer.

William E. Young, CPA 13901 Jefferson Davis Hwy. Woodbridge, VA 22191

Minspeak Applauded

I read with great attention the "Minspeak" article by Bruce Baker (September 1982 BYTE, page 86). Minspeak is the most exciting use of computer technology that I have encountered because it goes beyond the use of the computer to manipulate data and/or symbols and deals with the fundamental issues of human communication and the way we think.

While Mr. Baker deals almost exclusively with the application of Minspeak to the nonspeaking population, the fundamental idea behind his invention, I believe, has a great deal to say about how we think and how we communicate whole thoughts to one another in speech and nonspeech worlds.

I commend Mr. Baker and BYTE for moving beyond hardware and software

into the genuinely exciting new realms of electronic technology and its applications to human problems and potentials.

David O. Justice, Dean School for New Learning DePaul University 23 East Jackson Blvd. Chicago, IL 60604

Computer Poetry: Art or Craft?

Kevin McKean's article "Computers, Fiction, and Poetry" (July 1982 BYTE, page 50) nearly supplies some important implications about the nature of creativity. The examples of computer-written poetry suggest that computers can now make many judgments rapidly but cannot make them wisely. The reason seems to be that the computer, unlike the poet, uses programmed instruction to apply types of judgments to many words. The poet makes individual judgments on a word-by-word basis. Thus, in writing "And delves the parallels in Beauty's brow," Shakespeare probably thought "delves" a

good word for its "1" and "e" sounds, matched in "parallels," and for the overall dreamlike, wistful quality that the word contributes to the line. Of course, he may have had other reasons as well.

Today, because western culture seems to have weaker ties with tradition than in the past, and because ours is more than ever a culture without a sense of history, it is understandable that considerations of creativity focus on the ceaseless fluctuations common to the thought process. rather than on the decisions that artists make after much thought. Still, an artist may draw upon any or all of his life's history in order to pass judgment on a single word. His intellect, his moral integrity, his honesty, his passion, his love, his hope, his hate, his fear, his skepticism, his faith—in short, the sum of the poet's whole existence gives him the ability to make artistic judgments. And a sense of tradition supports the artist's individuality, which includes his powers of artistic discernment. Thus, in our ever-changing, prone-to-forgetfulness world, the popularity of computers is assured, but computers still lack what Keats called "the

Did You Hear the One About the Computer That Talks?

It's no joke.

With the ECHO speech synthesizer from Street Electronics whatever you type on the keyboard, your computer can say. The ECHO's text-to-speech system gives your computer an unlimited vocabulary while using a minimum of memory. And now a diskette of fixed, natural sounding words is available to enhance the ECHO I's voice output.

Nearly 400 language rules are contained in the ECHO's text-to-speech algorithm. These rules enable the computer to pronounce most correctly spelled words. When in the text-to-speech mode the user can select any of 63 different pitch levels, and have words spoken either monotonically or with intonation by using simple control character sequences. The rate of speech can be fast or slow; words can be spoken in their entirety or spelled letter by letter. The ECHOs also pronounce punctuation and numbers. Words can be encoded using phonemes and diphthongs when the text-to-speech or fixed vocabulary is not required.

Applications are unlimited, ranging from phone answering, educational and training programs, to games and aiding the sight and speech impaired. The ECHO is a complete stand alone unit which is compatible with most any computer; it sells for \$299.95. The ECHO II, which plugs into the Apple II, is priced at \$149.95.

Street Electronics Corporation 1140 Mark Avenue, Carpinteria, CA 93013 Telephone (805) 684-4593



Call toll free for demonstration (800) 221-0339

897 N.W. Grant Ave. • Corvallis, Oregon 97330 • 503/758-0521

Expanding Horizons in Text Display

Videoterm increases your Apple [[" display to a full capacity 80 columns. Proofreading text problems are a thing of the past. With Videoterm your text is displayed in upper and lower case characters with true descenders utilizing a 7 by 9 character matrix. The time-tested Videoterm is compatible with most word processors and is available with alternate character fonts. Once you've explored the advantages of Videoterm, you'll discover a whole new world for you and your Apple][.

Suggested retail price: \$345.00

ACCESSORIES

Videoterm Utilities Disc includes:

- •Graphics Template System
 - Font Editor •Mid-Res Graphics
 - Applesoft Read Screen Utility
 - •Top & Bottom Scrolling
 - Pascal Vidpatch Suggested price \$37.00

Videoterm Character Set **EPROMs**

- French
- •German
- Inverse
- •Katakana [Japanese] •Super & Subscript
- Math & Greek Symbols
- Norsk

N. European

- Russian
- Spanish
- Suggested price \$29.00 each.

Dvorak EPROM (Enhancer)—\$29.00 Lower Case Chip (Rev 7 & up)-\$29.00

SOFT VIDEO SWITCH



The Soft Video Switch is an automatic version of the popular Switchplate. It knows whether it should display 40 or 80 columns or Apple graphics. It does the tedious work of switching video-out signals so you don't have to. The Soft Video Switch can be controlled by software. May be used with any Videoterm with Firmware 2.0 or greater. The single wire shift mod is also supported. Package price is \$35.00.

Circle 427 on inquiry card.

ENHANCER 1



The Enhancer][features a typeahead buffer. Your keyboard has upper and lower case, and will auto repeat any key held down. A single keystroke can become a word or an entire sentence. Controlled by a powerful microprocessor, Enhancer][allows you to re-map your keyboard or add specialized features. Changing a chip creates a totally different keyboard. Enhancer [Utilities Disc included.

Suggested retail price \$149.00.

ARE YOU STILL LETTING YOUR PRINTER TIE UP YOUR COMPUTER?

While your printer is running, your computer is tied up. You can't use it for processing, computing, data entry. Nothing. All you can do is twiddle your thumbs until the program is finished.

Pretty ridiculous.

MICROBUFFER ALLOWS YOU TO PRINT AND PROCESS SIMULTANEOUSLY.

You just dump your printing data directly to Microbuffer, whoosh!, and continue processing. No waiting.

Microbuffer accepts data as fast as your computer can send it. It stores the data in its own memory buffer then takes control of the printer.

It's that easy.

THERE IS A MICROBUFFER FOR ANY COMPUTER/PRINTER COMBINATION.

Whatever your system, there is a specific Microbuffer designed to accommodate it.

FOR APPLE II COMPUTERS, Mircobuffer II features on-board firmware for text formatting and advanced graphics dump routines. Both serial and parllel versions have a power-efficient lowconsumption design. Special functions include Basic listing formatter, self-test, buffer zap, and transparent and maintain modes. The 16K model is priced at \$259 and the 32K, at \$299.

FOR EPSON PRINTERS, Microbuffer/E comes in two serial versions — 8K or 16K (upgradable to 32K) — and two parallel versions — 16K or 32K (upgradable to 64K). The serial buffer supports both hardware handshaking and XON-XOFF software handshaking at baud rates up to 19,200. Both interfaces are compatible with standard Epson commands, including GRAFTRAX-80 and GRAFTRAX-80 + . Prices range from \$159 to \$279.

ALL OTHER COMPUTER/PRINTER COMBINATIONS can be untied by the stand-alone Microbuffer In-line.

The serial stand-alone will support different input and output baud rates and different hand-shake protocol. Both serial and parallel versions are available in a 32K model at \$299 or 64K for \$349. Either can be user-upgraded to a total of 256K with 64K add-ons — just \$179 each.

SIMPLE TO INSTALL.

Microbuffer II is slot-independent. It slips directly inside the Apple II in any slot except zero.

Microbuffer/E mounts easily inside the existing auxiliary slot directly inside the Epson printer.

The stand-alone Microbuffer is

installed in-line between virtually any computer and any printer.

MICROBUFFER FROM PRACTICAL PERIPHERALS.

So what are you waiting for? Write to us for more information or ask your dealer for a demonstration.

When you see how much freedom Microbuffer will allow, you'll understand why it's so silly to be without one.

PRACTICAL PERIPHERALS, INC.™ 31245 LA BAYA DRIVE WESTLAKE VILLAGE, CA 91362 (213) 991-8200





MICROBUFFER FREES COMPUTERS.

PRINTER OPTIMIZER



Why buy a mere "spooler" when you can have THE PRINTER OPTIMIZER?

- * 64k to 256k spooling buffer
- * adapts different brands can mix Serial and Parallel
- character conversion: 1 to 1,
 1 to many, many to 1, ignore
 pushbutton automated access to
- * pushbutton automated access to your printer's various type styles and printing modes
- * several ways to PAUSE printing
 * access any character, graphic design or printer "trick" from any program at any time
- * special features for use as a MODEM buffer



The cost effective alternative.
Converts IBM, Adler/Royal, Olympia
and other Electronic Typewriters
into letter quality printers.

- * 2K memory buffer
- * access all typewriter characters and automated features
- * Serial or Parallel versions

 * Many proprietary features and commands insure compatibility with your system and software
- * Typesetting capability!

PETI²



Super low cost adaptor for new inexpensive portable Electronic Typewriters can yield typewriter and letter quality printer combination for around \$500 total!

- * perfect for "personal use"
 * easy "plug-in" Parallel
- connection to most computers
 compatible with popular word processing programs

APPLIED CREATIVE TECHNOLOGY

> 2723 Avenue E East, Suite 717 Arlington, Texas 76011 [817]-261-6905 [800]-433-5373

Letters_

knowledge of contrast, feeling for light and shade, all that information (primitive sense) necessary for a poem."

If you could accurately enter your whole life into a computer without leaving the minutest fact out, then the computer could possess a chance of becoming artistic. But even then the computer would have to be considered the protégé of its programmer. For now, computers may be profitably used as electronic thesauri, as servants to the new *craft* of electronic poetry-writing. As far as the *art* of poetry is concerned, computers will have to wait.

Rob Zseleczky 19 Tanglewood Lane Chatham, NJ 07928

Not-So-Standard Automobiles

In part 1 of his article "An Introduction to the Human Applications Standard Computer Interface" (October 1982 BYTE, page 291), Chris Rutkowski used the early development of the automobile as a case study to explain how microcomputer technology is still in its formative years because it has not come up with a standardized, easy-to-use format. This is a viable analogy, but Chris was a little off on his time frame. He says "you would be able to climb into the typical automobile of 1925 and drive it away." For most readers of BYTE today this would not be true. In 1925 approximately 50 percent of the cars being sold in the United States were Model T Fords. The Model T Ford used a pedal-controlled planetary transmission that a modern driver would not understand without instruction or prior use. Other 1925 makes also had irregular controls, such as spark levers, hand throttles, oddly placed starter buttons, etc. Actually, the standardization of most automobile operations took much longer than Chris surmised. Hopefully, the process will not take so long in the microcomputer industry.

Fred K. Fox 13150 El Capitan Way Delhi, CA 95315

Total Talk Talks Back

In response to David Stoffel's article "Talking Terminals" (September 1982 BYTE, page 218), I would like to thank BYTE for giving this subject the attention it deserves. However, as the manufacturer

of one of the products described by Mr. Stoffel, I'd like to state that numerous inaccuracies appear in his article.

Contrary to the impression given in the article, Total Talk from Maryland Computer Services Inc. (MCS) offers both a user-definable vocabulary and full numbers capabilities (it can speak 123 as "one two three" or "one hundred and twenty-three"). To my knowledge, MCS was the first to offer these features. It is also false that Total Talk does not have a cursor locator. Total Talk has had this since the product was introduced in June of 1980.

The author fails to mention many of the advantages of incorporating speech into an existing terminal. Total Talk offers an Enunciation key to tell you the terminal's status and the function of a key without executing the function; the device can vocalize the terminal's communication parameters and can set tabs and margins. Also you can define keys to perform specific tasks, such as say the line, say the word, and spell the word. This is essential to the nontechnical user in that escape codes do not have to be memorized.

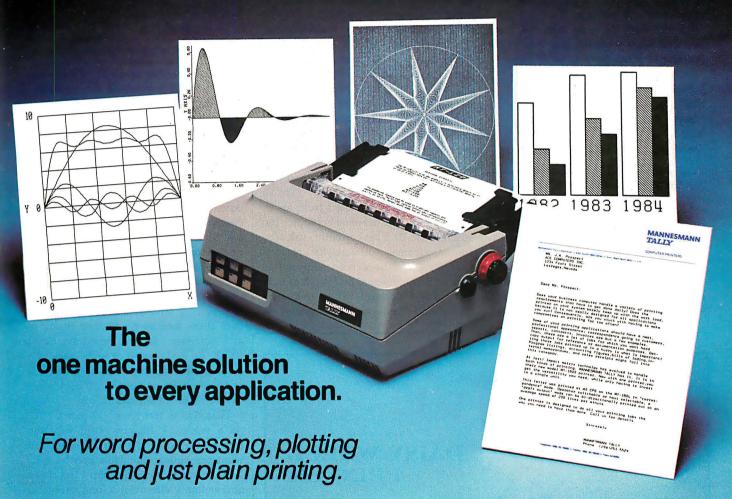
The approach that places the speech box between the terminal and the host has several disadvantages. What is displayed on the screen is not an accurate representation of what is stored in the speech box's buffer. This is a severe disadvantage when the blind operator must interact with sighted co-workers or instructors. Fullpage editing cannot be accomplished.

Capabilities that are very useful to Total Talk's users but were not mentioned in Mr. Stoffel's article are notification that the cursor is at the end of the line, moving the cursor forward and backward either a word at a time or a line at a time without speaking the word or line, and reading up and down columns.

Mr. Stoffel's comment that "Total Talk loses data after receiving 120 characters" shows a lack of understanding of the terminal. Total Talk has three sophisticated handshaking capabilities—XON/XOFF, Data Terminal Ready, and Inquire/Acknowledge. If your host computer does not support these capabilities, then you simply cannot use "Log Bottom," a feature that reads the data as it appears on the screen. If the terminal is configured correctly, data is not lost.

The article states that screen-oriented programs like Wordstar are not practical using speech output. We take exception to this because our customers are using Total Talk and Information Thru Speech (our

The ultimate under \$1000 printing machine.



Save the expense of a costly daisy wheel. Eliminate the limited capability of cheap matrix printers. And get plotting in the process!! Get the all new, advanced MT 160 multifunctional micro printer. You'll be amazed that such a small printer can house so much horsepower.

Capability? You name it, this printer's got it. A resident Report Package puts you in the Word Processing world...letter quality characters, proportional spacing, margin justification, auto centering, A resident Graphics Package lets you plot whatever your micro wants to portray. The standard print mode lets you generate reports fast—speeds up to 200 lines per minute. Also, print eight different resident character widths.

There's more. Clip-on paper handling attachments let you use fan-fold forms, letterhead, cut sheets or continuous roll paper. The control panel has a "menu select" for machine configuration. When you look under the hood, vou'll see what is meant by "solid construction." And the MT 160 is

plug compatible to your micro.

In short, the MT 160 is the epitome of engineering excellence. And it should be. Afterall. Mannesmann Tally is the technology leader in matrix printing.

MANNESMANN TALLY

8301 South 180th St. Kent, Washington 98032 Phone (206) 251-5524

DISTRIBUTION NOW!

WEST

Anacomp (206) 881-1113 Byte Industries (415) 783-8272 Kierulff Electronics (213) 725-0325 PGI Distribution (602) 967-1421 Waybern (714) 554-4520 Western Micro Technology (408) 725-1660 Acorn Data Products (303) 779-6644

CENTRAL

Hall-Mark Electronics (214) 341-1147 Information Systems (312) 228-5480 D.L. MacNeil, Inc. (312) 952-8300

Sysprint (214) 669-3666 (312) 870-7400

EAST Computermaxx (904) 878-4121 Digital Solutions (404) 955-4488 Hansen & Hughes (201) 652-7055

US Plus (203) 234-0444 Mannesmann Tally Canada (416) 661-9783 talking microcomputer/terminal) for this purpose every day. This also raises the question of why our Information Thru Speech terminal, which has been on the market since January of 1982, was never mentioned.

Finally, Mr. Stoffel hopes that the price of talking terminals will go down or their capabilities will increase. This is exactly what happened this year when MCS announced more powerful machines and a decrease in prices from 15 to 50 percent.

J. Michael Mason, Vice-President Marketing Maryland Computer Services Inc. 2010 Rock Spring Rd. Forest Hill, MD 21050

Terminology Correction

The use of terminology in Jack L. Abbot's review "Systems Plus: FMS-80" (October 1982 BYTE, page 447) was disturbing. The article was well written, informative, and provided a reasonable set of data from which to draw some conclusions and comparisons to other systems. However, to call FMS-80 a "relational"

DBMS (database-management system) is appalling. It is bad enough that vendors misuse terminology, but a publication should not further perpetrate such misguidance. Some purists might argue that FMS-80 is not even a DBMS. And there are purists who have strict rules on the definition of a relational DBMS. In either case, most experts agree that a relational DBMS has, at a minimum, specific functional (e.g., project and join) and representational (e.g., tabular user view) components as its foundation. What will you tell your readers when the true relational DBMS is developed for microcomputers? As the leading journal for smallsystems users, BYTE should attempt to use standard systems terminology when appropriate and not allow vendors to mislead the public any further than their advertisements do.

I do not want to detract from an extremely powerful personal computer tool such as FMS-80. I am currently evaluating file-management software for personal computers and have been surprised by the comprehensiveness and depth of functions of such packages. These rival many of the tools offered on larger systems and

should virtually eliminate for most users the need to create their own programs.

Michael Lutz, Manager Data Administration Davis Chemical Division W.R. Grace & Co. POB 2117 Baltimore, MD 21203

User's Column Under Fire

As a subscriber to BYTE, I am compelled to write questioning the professionalism of your monthly User's Column written by Jerry Pournelle.

BYTE is an informative computer magazine that stands head and shoulders above any other small systems journals. All the hardware reviews are concise and informative. Steve Ciarcia does an excellent job of breaking hardware design down to a simple process for most hobbyists. Sol Libes keeps the latest information on new products available for all readers.

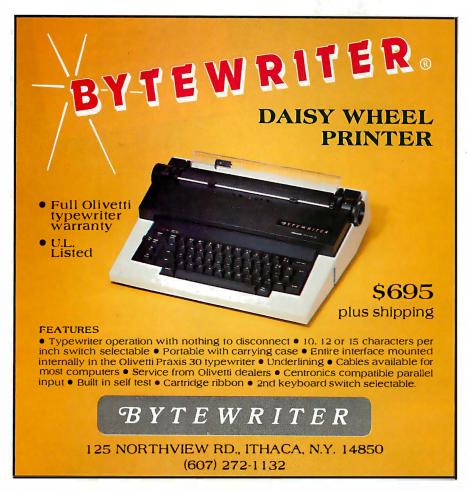
However, I find Mr. Pournelle's monthly column neither useful nor coherent. All I understand from his column is that he is always very busy and has many friends that allow him access to free hardware and software. In the Septebmer 1982 BYTE, he explained that he belongs to a large number of clubs and organizations and doesn't know how to do all the activities he does each month.

That kind of text has no place in BYTE. As a reader, I am concerned with the topics covered in the column, not with what the author did while preparing it. When reading User's Column I feel that I am reading a letter from a long lost friend who is trying to tell me everything that has happened during the last three years.

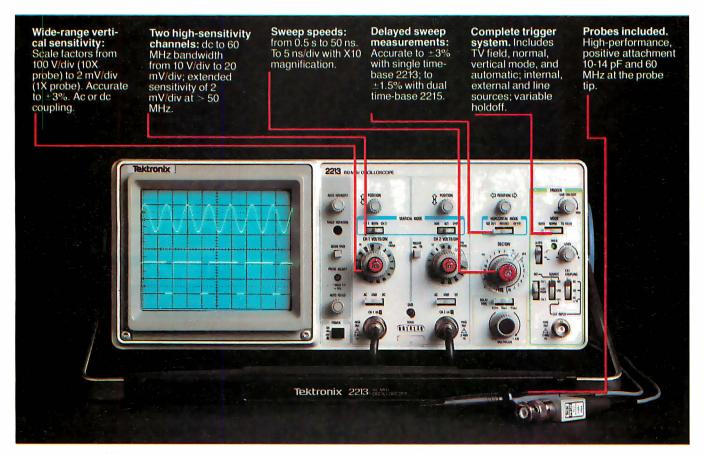
User's Column is both useful and necessary, but please keep it up to the fine standards that BYTE is known for. In future issues, don't allow Mr. Pournelle to ramble incoherently page after page.

Ron Dyer 40 Godstone Rd., Suite 305 Willowdale, Ontario M2I 3C7 Canada

I was appalled by Jerry Pournelle's recent defense of software hacking (see "User's Column: A BASIC and Pascal Benchmark, Elegance, Apologies, and FORTH," October 1982 BYTE, page 254). I defy you to name any other engineering discipline in which disorganized, patchas-you-go approaches are considered to be acceptable practice.



Now! A 60 MHz Tektronix scope built for your bench.



In 30 years of Tektronix oscilloscope leadership, no other scopes have recorded the immediate popular appeal of the Tek 2200 Series. The Tek 2213 and 2215 are unapproachable for the performance and reliability they offer at a surprisingly affordable price.

There's no compromise with Tektronix quality: The low cost is the result of a new design concept that cut mechanical parts by 65%. Cut cabling by 90%. Virtually eliminated board electrical connectors. And eliminated the need for a cooling fan.

Yet performance is written all over the front panels. There's the bandwidth for digital and analog circuits. The sensitivity for low signal measurements. The sweep speeds for fast logic families. And delayed sweep for fast, accurate timing measurements.

The cost: \$1200* for the 2213. \$1450* for the dual time base 2215.

You can order, or obtain more information, through the Tektronix National Marketing Center, where technical personnel can answer your questions and expedite delivery. Your direct order includes

probes, operating manuals, 15-day return policy and full Tektronix warranty.

For quantity purchases, please contact your local Tektronix sales representative.

Order toll free: 1-800-426-2200 Extension 45

In Oregon call collect: (503) 627-9000 Ext. 45

*Price F.O.B. Beaverton, OR. Price subject to change.



CAST BETTER, FASTER SPELLS WITH OUR CI-C86 C COMPILER



• CPM86 and MPM86 • DEC Rainbow • Zenith Z100

Victor 9000

especially designed for use with:

 MS-DOS IBM Personal

 Lomas 8086 Altos 8600

• Eagle Columbia 1600

IBM Displaywriter

• NEC APC

Compupro 86/87
 And Many More

CI puts all the magic of C at your fingertips with all of K&R, a full support library. 8087 support and much more.

Merlin would approve

Disk and documentation \$395. Overseas airmail \$20.

For further information, please contact:



Computer Innovations, Inc. 75 Pine Street Lincroft, New Jersey O7738

Telephone: (201) 530-0995

e trademarks of Computer Innovations, Inc. trademarks of Digital Research, nark of Microsoft, of Internet ademark of International Business Machines rademark of Digital Equipment Corp.



Letters_

Clear thought solves problems. Code does not solve problems. Code implements the solutions to problems.

Computer languages form a class of tools to aid in clear thought. Other tools include formal mathematics, eloquent English, and analysis techniques specific to the problem area.

Office buildings, bridges, dams, oil pipelines, rapid transit systems, some large ships, new forms of life created by means of recombinant DNA, movies, newspaper articles, and letters to the editor of BYTE, all are one-of-a-kind creations. Their creators undoubtedly work under as much pressure as that experienced by computer programmers. Which of these creations would Mr. Pournelle like to see built by the same techniques he advocates for software?

Daniel Ross Succinct Systems 1346 River St. Santa Cruz, CA 95060 ■

BYTE's Bits

Data General Opens Customer Center In Dallas

Data General recently opened a customer training center in Dallas, Texas. The center was established to provide local access to the firm's training services for end-users and OEMs (original equipment manufacturers) in the southwestern United States. The center has three classrooms, administrative offices, and a systems training laboratory housing an Eclipse computer and linked Dasher terminals capable of accommodating 18 users simultaneously.

Through the center, nearby users will have access to hardware and software training at their sites, self-paced instructional training, and other training alternatives offered by the company. In addition, free educational planning and consulting services and an ongoing schedule of lecture courses on Data General software, utilities, and programming languages are provided by the center.

Data General maintains training centers in Atlanta, Boston, Chicago, Los Angeles, Washington, D.C., six European countries, and Australia-New Zealand. For more information on the newest training center, contact Customer Education, Data General Corp., 4350 Alpha Rd., Dallas, TX 75234, (214) 458-2945. ■



GREAT IDEAS... Down to Earth Products



SDS-ZS10/4 4 RS232 Channels Full Duplex Real Time Clock



SDS-HARD DISK INTERFACE Micropolis 1220 Series or ST-506 Interface Adapter

A Shining New Star



- 5¼" Hard Disk
- 96 TPI Floppy
- 6 Slot S-100 Mainframe See page for details



NEC-FLOPPY DISK DRIVE

Double Sided Single Density/Double Density Up to 2.4 Megabyte (Qume Now Available)



SDS-MULTIPLEXER/DISPLAY

Three RS232C 1 to 2 Switches Two Seven Segment Status Display (Can be used as a line monitor for data communications link) (route RS232 to one of two devices)

*TURBODOS TANDEM



SDS-MASTER



SDS-SLAVE

SDS-SINGLE BOARD COMPUTERS

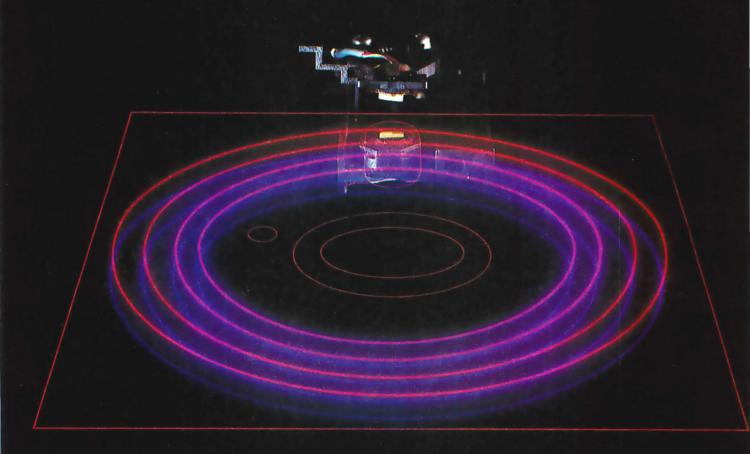
Z80 CPU 64K Bank Switch Memory 2 RS232 Channels 4 Timers IEEE 696 Buss 4 Parallel ports NEC 765 FDC with PLL to all Shugart compatible drives (SDS-Master only) *CP/M 2.2 & 3.0

- *CP/M Registered trademark of Digital Research
- *TurboDOS Registered trademark of Software 2000

SIERRA DATA SCIENCES

Fresno CA/Marketing Division 21162 Lorain Ave., Fairview Park, Ohio 44126 (216) 331-8500 Telex. 980131 WDMR

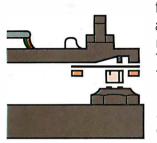
Rana's disk drive was twice as good as Apple's with one head.



Now we have two.

We added another head so you won't have to buy another disk.

That's the beauty of a double sided head. A floppy disk which allows you to read and write on both sides. For more storage, for more information,



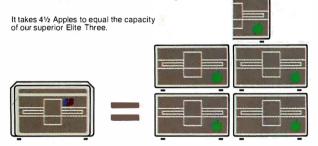
Rana's double sided heads give Apple Il superior disk performance power than second generation personal computers such as IBM's.

for keeping larger records, and for improved performance of your system. That's what our new Elite Two and Elite Three offers. It's the first double headed Apple® compatible disk drive in the industry. And of course, the technology is from Rana. We're the company who gave you 163K

bytes of storage with our Elite One, a 14% increase over Apple's. And now with our high tech double sided heads, our Elite Two and Three offers you two to four times more storage than Apple's. That's really taking a byte out of the competition.

We put our heads together to give you a superior disk drive.

We designed the Elite Three to give you near hard disk capacity, with all the advantages of a minifloppy system. The double sided head operates on 80 tracks per side, giving you a capacity of 652K bytes. It would take 4½ Apples to give you that. And cost you three times our Elite Three's reasonable \$849 pricetag.



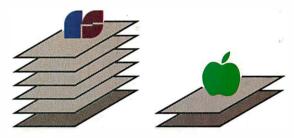
The Elite Two offers an impressive 326K bytes and 40 tracks on each side. This drive is making a real hit with users who need extra storage, but don't require top-of-the-line capacity. Costwise, it takes 2½ Apple drives to equal the performance of our Elite Two. And twice as many diskettes. Leave it to Rana to produce the most cost efficient disk drive in the world.

We've always had the guts to be a leader.

Our double sided head may be an industry first for Apple computers, but nobody was surprised.



They've come to expect it from us. Because Rana has always been a leader. We were the first with a write protect feature, increased capacity,



Your word processor stores 5 times as many pages of text on an Elite Three diskette as the cost ineffective Apple.

and accurate head positioning. A first with attractive styling, faster access time, and the convenience of storing a lot more pages on far fewer diskettes. We were first to bring high technology to a higher level of quality.

So ask for an Elite One, Two, or Three. Because when it comes to disk drives, nobody uses their head like Rana.

RanaSystems





20620 South Leapwood Avenue, Carson, CA 90746 213-538-2353. For dealer information call toll free: 1-800-421-2207. In California only call: 1-800-262-1221. Source Number: TCT-654 Circle 365 on Inquiry card.

Available at all participating Computerland stores and other fine computer dealers.

. . faithfully captures the look, spirit and play of arcade 'Space Invaders'"

-John Anderson, Creative Computing "All are excellent versions of the arcade games with super graphics and sound."

-Mark Benioff A.N.A.L.Ö.G.

"The graphics display, , sounds and game logic are so close to the original, that you might find yourself looking for the coin slot on your computer."

-Gary and Marcia Rose

" 'Deluxe Invaders' is by far the best Space Invaders program ever released for a personal computer."

> -Leigh Goldstein, Electronic Games



We are Serious About Our Games!

Product Description

The Lisa Computer System

Apple designs a new kind of machine.

Gregg Williams Senior Editor

I had an interesting conversation with an engineer on a recent flight from San Francisco to New York. He knew only a little about microcomputers, but he was aware that their presence is slowly becoming more common in the workplace. "Sure, the industry is healthy, but it's still only reaching a few people," he said. "Most people won't use computers—they're afraid of them, they don't know what to use them for, or it's too much trouble to use them. Before computers become *really* profitable, they're going to have to be very easy to use. They have to be simple. They've got to be useful in the office."

He continued, "We've got to stop using paper which means the computer has to do word processing, filing, electronic mail, everything—or it'll be too much trouble having some things on the computer and others on paper. Then you've got to be able to talk to other computers other computers like yours and some big corporate computer that's halfway across the country. Sure, it's a lot of stuff, but when you get all that together, then you'll see computers really take off."

What could I say? Not very much, for two reasons. First, he was

absolutely right—we need all that and more before computers become as commonplace as color TVs and electric typewriters. Second, I had agreed not to talk about a computer I had just seen that meets many of his points: Apple Computer's highly secret Lisa computer (see photo 1).

The Lisa at Work

Before we take a detailed look at what the Lisa is and how it came about, let's look at an example of what it can do. Suppose I'm writing a report for my boss and I want to prepare a chart to illustrate a certain point. With a few movements of the *mouse* (more on this pointing device later), I "tear off" a sheet of Lisa Graph "paper" (thus activating a program called Lisa Calc and displaying an empty grid on the screen) and give it the heading "Annual Sales." I then type my numbers into the grid, name the graph and the x and y axes, and request a bar graph.

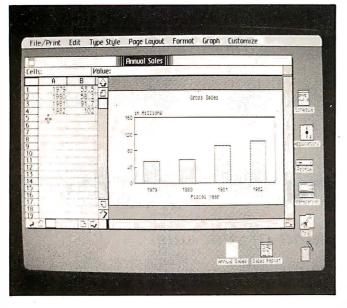
Voilà: I get the bar graph (superimposed on top of the data) shown in photo 2a. At this point, I can simply print the graph or save it for inclusion with my report, but I'm not satisfied with the way it looks. I then use the mouse to "cut" the graph from the Lisa Graph paper and put it in a temporary storage place called the clipboard. I can then "throw away" the Lisa Graph "paper" I was using.

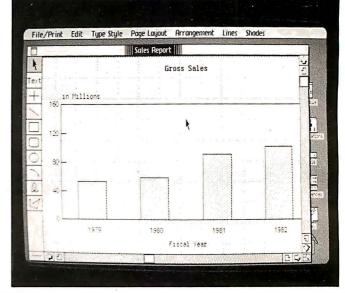
My next step is to "tear off" a sheet of Lisa Calc "paper" and paste my "Annual Sales" bar chart from the clipboard onto it. Photo 2b shows the result.

I want to make the bars darker, so I use the mouse to move the cursor (the arrow pointing diagonally up in photo 2b) onto the rectangle and tell the computer that I want to work on that bar by clicking the button on top of the mouse twice. (I could almost as easily have selected all four bars, but I'll just do one here.) As a result, the bar



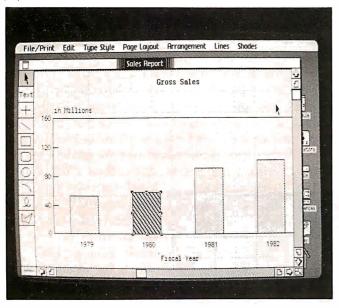
What could I say? Not Photo 1: The Lisa computer system.





(2e)

Photos 2a-j: Creating a chart using the Lisa Graph and Lisa Draw programs. See the text for details of how the image is generated and changed.

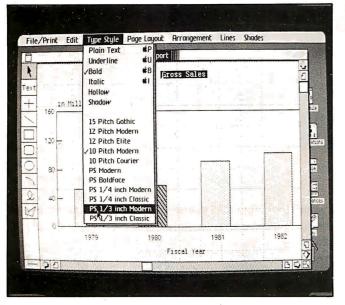


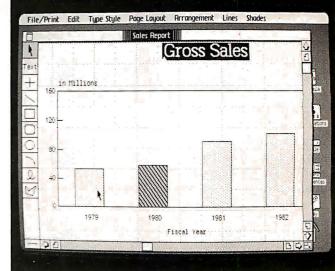
is selected, as shown in photo 2c. (In the Lisa system, you first select what you want to work on, then you select the action you want performed.) The small black squares that appear on the edge of the object are called *handles*; not only do they show which object has been selected, they also serve as "handles" by which the cursor can move or alter a shape.

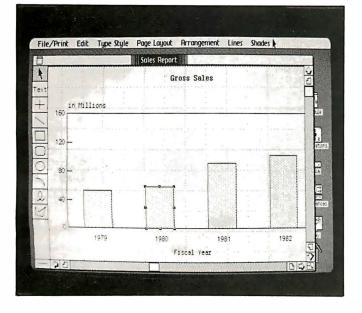
Now that the bar is selected, I move the cursor to one of the menu titles at the top of the screen (also shown in photo 2c). I see the menu of possible actions by pointing the cursor at the menu title and holding down the mouse button (photo 2d). Here, the menu is a grid of 36 varieties of shading that can be used to fill the selected area. When I move the cursor to the desired shade box and let up on the mouse button, the pop-up menu, as it is called,

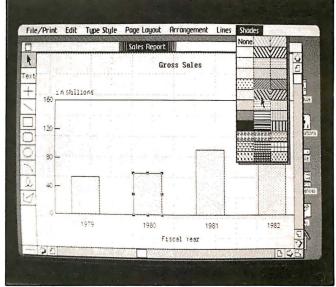
(2g)

(2h)









File/Print Edit Type Style Page Layout Arrangement Lines Shades

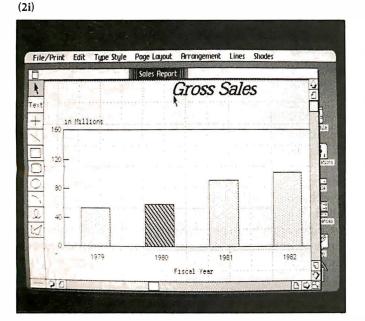
Sales Report

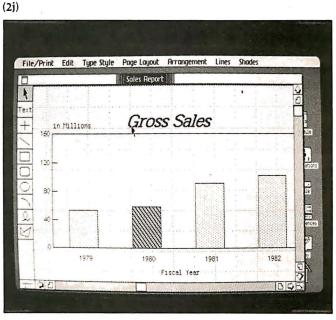
disappears and the shading fills the box (photo 2e).

It is equally simple to change the size, type style, and position of the title "Gross Sales." By holding down the mouse button when the cursor points just to the left of the first letter and letting it up when the cursor points just past the last letter, I can select an area of text that the Lisa then puts in reverse video (photo 2f). When I select an option from the "Type Style" menu (photo 2g), the text is redisplayed in its new size and style (photo 2h). I then modify the title to an italic font in a similar way (photo 2i). Finally, I pick up the title with the cursor, "drag" it to a new location, and leave it there (photo 2j). Many other alterations are possible. When I'm satisfied with the graph, I can print it, save it, or do both.

This example conveys only a fraction of the speed and the ease of use associated with the Lisa computer and the programs that go with it. Now that we've seen the system at work, let's take a look at what makes it so different.

/2:\





Fiscal Year

(2f)

Text

in Millions

1979

E Froes

The Evolution of Software

It is instructive to see to what degree software is a part of Apple products. The basic Apple II, released in 1977, comes with about 16K bytes of object code. The Apple III, released in 1980, has about 200K bytes of code. The Lisa has more than 2 megabytes (2048K bytes) of code, a staggering figure that hints at the tremendous effort that goes into implementing a good piece of software.

The history of microcomputing has been exciting so far because it has enabled individuals working in their spare time to make significant contributions to the state of the art. But that has changed: now most state-of-the-art software is the province of teams of programmers hired by companies, as opposed to individual programmers working for themselves. As programs grow more sophisticated (requiring teams of programmers) and have to be more carefully planned to meet users' needs (requiring experts in given fields to be added to the team of designers), the implementation of programs is becoming a team effort. The days of the successful entrepreneur/programmer are probably gone.

he team of designers), the implementation of programs is pecoming a team effort. The days of the successful entrepreneur/programmer are probably gone. Photo 3: The "mouse" pointing device is about the size of a package of cigarettes and has one button on top.

Foundations of the Lisa Design

The design effort that resulted in the Lisa computer is remarkably innovative because the designers did what designers should do—define the product's prospective customers, determine their needs, and then design a product to meet those needs. Apple was also willing to give its designers enough time and money (with no marketing restrictions attached) to first design and then create a computer that redefines the expression "state of the art." Granted, the Lisa's designers drew heavily on previous work done at Xerox PARC (Palo Alto Research Center), but they refined several borrowed elements and combined them with numerous innovations. (For further information on the design process, see "An Interview with Wayne Rosing, Bruce Daniels, and Larry Tesler" on page 90.)

Apple started this project with the intention of creating not only a product but the foundation for a whole new computer technology, one that would create computers literally anybody can use. The company's first task was to devise a new *user interface*—that is, a new and better way for humans to interact with the computer. The result was an internal (to Apple Computer Inc.) "User Interface Standards" document that describes how a user interacts with the Lisa system.

Although the Lisa design has several important elements, four stand out: the machine's graphics-mouse orientation, the "desktop" and "data-as-concrete-object" metaphors, and the integrated design of the hardware and software. Let's look at each of these in turn.

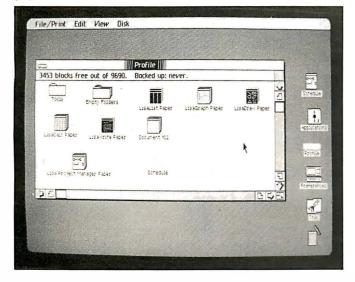
The graphics-mouse orientation: The traditional text display and keyboard input device make for a computer that is—let's face it—not too easy to use. Apple decided that the graphics resolution of the machine had to be high enough to use pictures (often called *icons* by Apple) in place of text. (For example, see the icons on the right-hand side of photo 2a.) Pictures are more easily recognized and understood than text. Because of this, you can

probably figure out that the garbage-can icon in photo 2a is used to throw something away.

Apple also knew that it needed a new, easier-to-use input device to move the frequently used arrow-shaped cursor. The designers passed over such devices as light pens and touch-sensitive video panels in favor of the mouse, a pointing device used in several Xerox PARC machines. The mouse, which is about the size of a pack of cigarettes, has a small bearing on the bottom and one or more buttons on the top (see photo 3). When you hold it in your hand and slide it across a flat surface, the mouse sends signals to the computer, which guide the video cursor in the direction that you've moved the mouse. The mouse Apple designed has only one button; Apple broke with the conventional wisdom of two- and three-button mice after user tests indicated that people aren't always sure which button to push on a multiple-button mouse.

With graphics of sufficient quality and a mouse, the Lisa lets you get what you want by pointing at it. Because the video cursor moves in direct response to the way the hand moves the mouse, you feel as if you're actually pointing at something on the screen. This has the positive psychological effect of making you feel in control.

The "desktop" metaphor: When you turn on the Lisa system, the screen is empty except for the presence of several icons. The Lisa computer depends on the metaphor that the video display is a desktop, while the icons are objects on the desktop. Each peripheral connected to the Lisa (floppy and hard disks, printers, and other peripherals connected by interface cards) is represented on the desktop by either an icon (if it is not in use) or a rectangular area called a window (if it is available for use). The Lisa computer normally replaces the conventional file directory with a collection of objects displayed in the window of the associated mass-storage device. Each file is represented by an object of some sort—usually a report, a tool, or a document—and objects can be grouped together in folders, which are also treated as objects. (Actually, the



File/Print Edit View Disk Profile 3607 blocks free out of 9690. Backed up: never M

computer can give you a conventional directory on request, but only traditional computer users will ask for this option.)

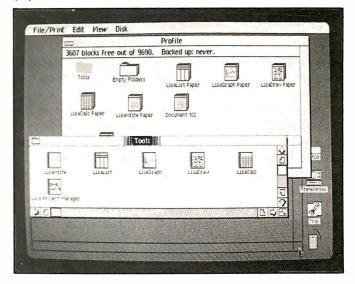
An example of the Lisa file system will illustrate how useful this metaphor is. From a cleaned-up desktop with nothing but icons on the right of the screen, I use the mouse to point to the Profile (hard disk) icon and click the mouse button twice; this has the effect of "opening" the Profile and displaying its contents. The Profile icon changes to a white silhouette and its original black-onwhite shape expands to a window named "Profile." (Photo 4a was taken after three items-shown as black iconshad been selected for manipulation. When the Profile icon is first opened, all of the icons inside it are white—that is, unselected.)

To view and then work with the contents of the Tools folder, I put the cursor on the folder and click the mouse button twice. The icon expands, leaving a gray silhouette and a window named "Tools," as shown in photo 4b. The window is just that—a window into whatever the Tools folder contains. The symbols on the margin of each window are points from which the cursor can direct several operations on the window. For example, when the cursor points to the small folder icon in the upper lefthand corner of the Tools window and the mouse button is clicked twice, the folder "closes" and the video display reverts to the image it had before the folder was opened.

If the Tools folder contains more than the window can show, you can do one of two things to see the additional contents. First, you can scroll the window either horizontally or vertically. Second, you can put the cursor on the expand/contract icon (in the lower right-hand corner of the window), hold down the mouse button, and move the cursor. An outline of the window follows the cursor (photo 4c); when the mouse button is released, the window grows to its new size (photo 4d).

Once you've been shown the mechanics of manipulating objects and windows, you have a working knowledge of





(4d)

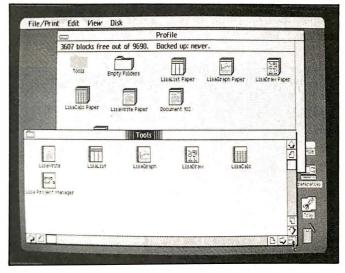
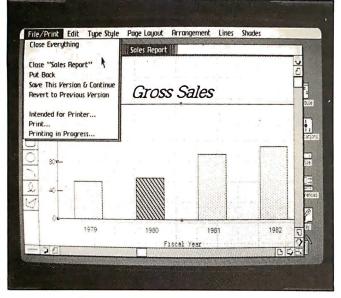


Photo 4a-d: File management on the Lisa system. Files, collections of files, and peripherals appear as pictures or icons (4a). When you open the Tools icon, its contents appear in a separate window (4b). The user can dynamically manipulate the window in several ways; in photo 4b-d, the window is enlarged.



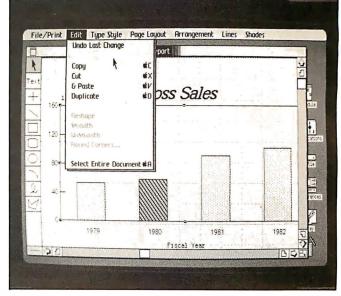
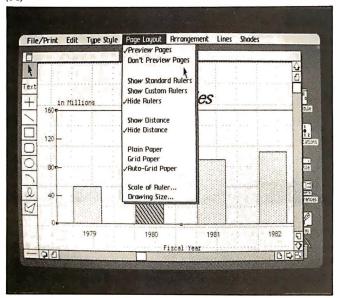


Photo 5a-d: Additional pop-up menus for the Lisa Draw program.

several essential operations of the Lisa file system (called the "Desktop Manager"). The desktop metaphor does two things for you. It helps you to remember certain operations because they make sense in the context of the object-related icons. Second, it draws on your general knowledge of office supplies and how they are used. These elements help Apple achieve its objective of creating a system that people can learn to use some aspect of in under 30 minutes.

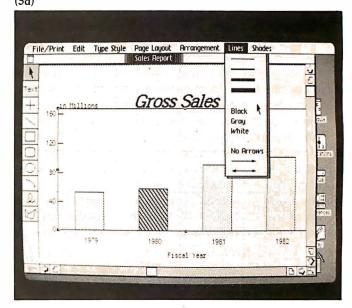
The "data-as-concrete-object" metaphor: More than anything else, this metaphor is the foundation of the Lisa computer design and its probable success. As you can see from the example above, the Lisa file system makes you feel as if you are actually moving and changing objects, not merely manipulating abstract data. The Lisa Graph/Lisa Draw example shown in photos 2a through 2j creates the same illusion, as do all the other Lisa application programs.

(5c)



The "data-as-concrete-object" metaphor depends on a condition most computer programs don't fulfill: that intuitively reasonable operations can be performed on objects at any time. Most computer programs have modes that restrict your activities at any given time; for example, many word-processing programs don't let you do numeric calculations and then incorporate them into the document you're writing. With the Lisa application programs, however, you can switch your attention from a sheet of Lisa Write "paper" to a sheet of Lisa Calc "paper" and back with no problem, just as you could if they were two sheets of paper on your desk.

Because you deal with recognizable objects such as folders and reports, you feel secure in the knowledge that your data will not disappear. "After all," it seems to be telling you, "computer files can mysteriously disappear, but folders, reports, and tools do not. If a file disappears, there's a logical explanation—either you threw it away or (5d)



vou filed it elsewhere. In either case, the situation is still under vour control." In other words, the "data-asconcrete-object" metaphor demystifies the computer by transforming data into physical objects that behave in a predictable and reasonable way.

Integrated design: Not only is the Lisa computer the result of an integrated design, it is also the result of an iterated one. The Lisa hardware and software were designed only after Apple had identified the needs of its target users. Once a given version of the system was implemented, it was

tested by the kind of people who would eventually be using it. The test findings dictated hardware and software changes, and Apple went through the design/test/revise cycle several times until everybody was satisfied with the result. This ensures that the Lisa does not fall prey to a problem common to microcomputers: being technologically sophisticated, but still hard or inconvenient to use.

During the iterations of the design process, the Apple design team looked for opportunities to have separate Lisa programs do their tasks in the same way. It then

incorporated these common operating procedures into the Apple user-interface standard and tried to apply them to other Lisa programs. The result is a large amount of common behavior and structure among

all the Lisa programs. For example, you enlarge or move a window the same way whether it is a Lisa Calc window or a Lisa Draw window. You also open, close, copy, and rename objects the same way throughout the system.

According to Apple, this attempt at standardization has two advantages. First, it shortens the time an average person takes to become comfortable with a system from a range of 20 to 40 hours (Apple's estimate, based on tests it conducted) to several hours. Second, it lets you apply what you learn in one program to all other programs. This commonality among Lisa programs is largely responsible for the ease with which beginners learn how to do something useful on the Lisa computer; it usually takes less than half an hour, even for people who have never sat in front of a computer before.

The Lisa Application Programs

The Lisa system will be offered with six application programs. Both new packages and improved versions of the first six programs will be offered at a later date, and in

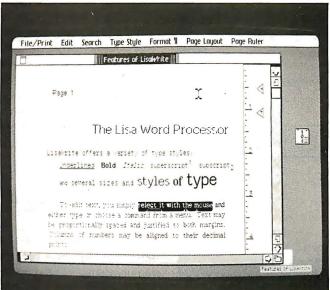


Photo 6: A document being prepared using Lisa Write.

The "Undo Last Change" command

each program. Instead, I will comment briefly on each one and say that, in general, all of them have more options and features than most people will use.

(See photos in which popup menus are visible for an

time third-party software

developers working with

cooperation from Apple

will create additional

programs. At this writing,

no price had been set for the

programs, but Apple

expects them to cost be-

tween \$300 and \$500 each,

a justifiable price for

describe all the features of

I don't have room here to

programs of this caliber.

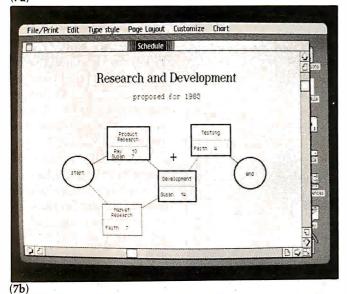
idea of some of the commands available.) One in particular deserves mention: the "Undo Last Change" command, which is available in every program. This wonderful command lets you undo the effects of the last one you issued. It's a tremendous security blanket that enables you to experiment and work without worrying about making an irrevocable mistake.

Here are the six application programs (a telecommunications program, Lisa Terminal, is covered in the section on "Communications and Databases."):

> Lisa Draw is easily the showpiece of the Lisa system. The example in photos 2b through 2j shows only a small part of what it can do. See photos 2d, 2g, and 5a through 5d for some of the pop-up menus. Lisa

Draw enables you to draw lines, boxes, circles and ellipses, arcs, and polygons—all with the mouse. You can add text at any place in any of 11 typeface/size combinations. In addition, you can modify any typeface with any combination of underline, bold, italic, hollow, and shadow styles for a combination of 11×2^5 or 352 distinct kinds of type. Lisa Draw has grids and rulers that can be displayed to help make drawings neat. Shapes can be selected and centered by a given horizontal or vertical edge. You also put Lisa Draw in an "auto-grid" mode that causes lines and shapes to align themselves with the grid you have chosen. Drawings can cover as many as 25 pages; Lisa Draw prints them out a page at a time and you join the edges together to make a larger drawing—a convenient feature if your drawing can't fit on one page. This program is a joy to use.

Lisa Write is the best "what-you-see-is-what-you-get" word processor I've seen. Between the keyboard and the mouse, you can add, change, delete, and move text, change its appearance, reformat it, and do just about



File/Print Edit Type style Page Layout Customize Chart

| Schedule | Schedule

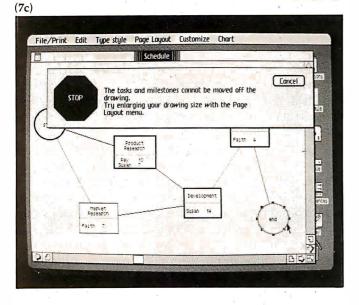


Photo 7a-c: The Lisa Project Manager program. Photo 7a shows a simple PERT chart with tasks on the critical path being heavily outlined; 7b shows a Gantt chart, which shows personnel utilization; 7c shows the kind of typical error message used throughout the Lisa system.

anything you'd want to in a word processor. Of course, you can see each page exactly as it will appear on paper (see photo 6). My only criticism of the program is that the version I saw paused a second or so between when I typed a phrase and when it appeared on the screen. The delay is due to the large amount of processing the machine has to do before it can display the new text (and perhaps scroll other text down), but the designers are aware of the problem and are working on minimizing the time delay in the final version.

Lisa Project is used to keep track of projects and personnel, and it does so using PERT (Program Evaluation and Review Technique), Gantt, and task charts. Using the mouse and the keyboard, you can add, delete, move, change, and label activity boxes. Each box contains the activity name and its personnel and time requirements. The Lisa Project program displays the PERT chart (see photo 7a), drawing a heavy outline around the activity boxes on the critical path (a path of activities for which delays will lengthen the duration of the project). The program can also optionally use such information as worker vacation times and the length of the work week to influence the final chart. You can also have the program show the early-start, early-finish, late-start, and late-finish dates associated with the PERT method. The Gantt chart (photo 7b) shows resource utilization over time, including unutilized resources (shown in gray). The task chart (not shown) displays tasks by their early-start date.

Like the rest of the Lisa system, Lisa Project gives you incredibly clear error messages. For example, when you try to take the "end" circle off the screen, you get the error shown in photo 7c, which must be answered before you can continue.

Lisa Calc is as sophisticated a spreadsheet program as any other on the market. In this instance, I don't think the mouse improves on cursor keys because one hand has to alternate between the mouse (to move the spreadsheet cursor) and the keyboard (to enter data into the spreadsheet cells). In any case, most people who want a Lisa computer are interested in the kind of structured numeric recalculation that spreadsheets are good at, and Lisa Calc certainly fills this need. Of course, data can be traded between Lisa Calc and other Lisa programs without restriction, which means, for example, that you can "paste" a section of spreadsheet data into a document being prepared by Lisa Write. Photos 8a and 8b show the process of displaying the formula of each cell along with its value.

Lisa List, a single-user database that permits records of up to 100 fields totaling 1000 bytes, probably illustrates best the "data-as-concrete-object" metaphor. When you add, change, or search for records, you work directly on the list visible in the window, not on an auxiliary display (like a data-entry screen) that limits you to working on the current record only. Record fields are defined as being one of eight data types (text, number, date, money, time, social-security number, phone number, or zip code), and Lisa List does automatic type-checking during data entry. Photo 9 shows an example of a Lisa List window. One

slight problem is that the social-security number, phone number, and zip code fields have fixed formats—for example, zip codes are limited to five digits. You must revert to the general-purpose text format if you want to be able to convert to 9-digit zip codes or use foreign telephone

Lisa List has many attractive features. Of course, you can display or print parts of the list in many ways; you can sort the list in several ways or select records according to given criteria. You can move the cursor with either the mouse or the arrow keys. The contents of fields are stored internally in a compact form to increase the overall storage capacity of the program. In addition, Lisa List has two very useful features that every database should have: the ability to add fields to or change field widths in an existing file and the ability to put any amount of information in a field regardless of its stated width (field width influences only how much data is visible).

Lisa Graph is an application program that creates a bridge between the number-oriented Lisa Calc and the picture-oriented Lisa Draw. Lisa Graph takes a matrix of numbers (entered either by the user from Lisa Graph or transferred from another source) and creates virtually instantly a bar, line, mixed bar and line, scatter (*x*-*y* plot), or pie chart. Photo 2a shows a typical Lisa Graph window, and the sequence of photos 2a through 2j shows how Lisa Draw can customize a drawing from Lisa Graph.

Reliability

numbers.

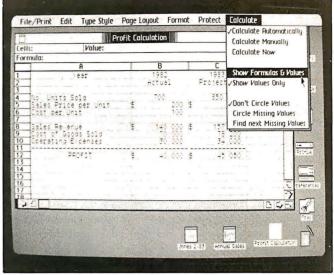
Computers are worthless if nobody uses them, and the Lisa system has made great strides toward eliminating that possibility. Certainly, it has been designed to be easy to use. But the Lisa system will probably be used by computer novices because of its *reliability*, both in the physical and psychological sense.

Physical reliability is the kind that makes an engineer feel secure. Apple IIs, for instance, have a reputation for being very reliable, and I'm sure that the Lisa computer was engineered with even more care. (For example, the Lisa is constructed as a series of modules, any one of which you can pull out without tools. And despite its internal complexity, it was engineered to dissipate excess heat without a cooling fan – that's engineering!)

I can't say how reliable the Lisa is overall because I don't have enough direct experience with it. But I do know that Apple has concentrated on improving the reliability of the source of a great many problems: the floppy disk. Despite the features of the Lisa disk drive that put it at the leading edge of disk technology (see the text box 'The Lisa Hardware" for more details), Apple claims that the hardware (assisted by its sophisticated disk-accessing software) has an error rate so low that Apple couldn't quantify it during tests. Apple said, however, that the hardware makes less than one error in one trillion (1012) operations.

Apple has also adopted a redundant data structure for information on the disk that lessens (or sometimes eliminates) the effect of losing a sector of information. This redundancy is on three levels—blocks, files, and

(8a)



(8b)

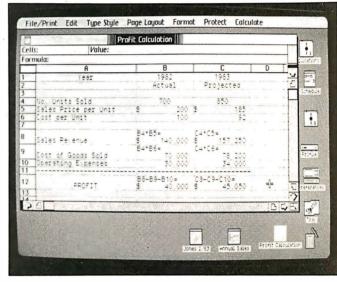


Photo 8a-b: The Lisa Calc program. Photo 8a shows a simple spreadsheet; 8b shows the same spreadsheet after the "Show Formulas and Values" command is executed.

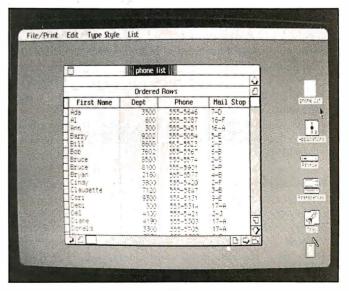


Photo 9: The Lisa List program, a single-user list-management program.

The Lisa Hardware

Reporting on the technical specifications of a computer toward the end of an article is unusual for BYTE, but it emphasizes that the why of Lisa is more important than the what. For part of the market, at least, the Lisa computer will change the emphasis of microcomputing from "How much RAM does it have?" to "What can it do for me?" For example, it is almost misleading to say that the Lisa comes with one megabyte of RAM, even though the fact itself is true. That doesn't mean that the Lisa is sixteen times better than machines that have 64K bytes of RAM. Nor does it necessarily mean that the Lisa can work on much larger data files than other computers; its application programs each take 200K to 300K bytes, which significantly reduces the memory available for data. It's more instructive to say, for example, that the Lisa with one megabyte

can hold a 100-row by 50-column spreadsheet (as its advertisements state). With this in mind, let's take a look at the Lisa.

"Lisa" stands for Local Integrated Software Architecture, but it's really just an excuse to retain Apple's pet name for the project. The Lisa has a 68000 microprocessor, which is a true 16-bit microcomputer that has a 16-bit data bus, a 24-bit address bus (giving access to 16 megabytes of memory), and 32-bit-wide

registers (all but the 16-bit status register). The 68000 in the Lisa runs at a frequency of 5 MHz. It can have up to 1 megabyte of memory with parity and comes standard with one megabyte (1024K bytes).

The video display is a 12-inch monochrome monitor (black and white, not tinted) with a resolution of 720 by 364 pixels. The interlaced image is refreshed at 60 Hz, which eliminates the possibility of eyestrain from subliminal flickering. The video display is completely generated by internal software, so the Lisa can use multiple character sizes and fonts without restriction. It also means that Apple is not restricted to any one style of video image; the designers can radically change the behavior of the system with a new release of software.

The Apple 871 disk drives design (called "twiggy drives" inside the company) are significantly different from conventional floppy-disk drives. Each one uses a 6504 microprocessor as a "smart" interface between it and the Lisa. The drives use special high-density, double-sided floppy disks that have two oval cutouts in the jacket (see photo below). These are essential because the two disk heads, in addition to being on opposite sides of the flat magnetic media, are not pointed at each other with the magnetic media between them, as is the case in all other double-sided floppy-disk drives. Instead, a pad presses the rotating magnetic media to the disk head on the opposite side of the media as is conventionally done with single-headed floppy disks.

Each formatted disk holds 860K bytes of information at a density of 62.5 tracks per inch; together the two drives (standard on the Lisa) hold 1.72 megabytes of data. Each drive also contains a mechanism that releases the disk for removal under program control, which prevents the user from removing a floppy disk prematurely. As with other Apple products, the floppy disks rotate only when the drives are reading or writing data, thus extending the lives of both the drives and the medium.

Apple has done several things to achieve its unusually high data density. The designers used an encoding scheme that keeps a constant data density of 10,000 bits per linear inch; this allows the outer floppy-disk tracks, which have a larger circumference, to store more data than the tracks nearest the

center of the disk. In addition, the disk-access system software can move the disk heads in fractions of a track width to search for and find the middle of the track. That's an important feature when you're reading disks with small variations in track width.

In addition, the Lisa comes with one Profile (Apple's 5½-inch Winchester-type hard disk) to the Lisa through its parallel port. It adds 5 megabytes of magnetic storage to the

Lisa system, and speeds up the overall operation of the system. Additional Profiles can be added via interface cards.

The Lisa computer is never really turned off. It stores "system preferences" (things like speaker volume and video contrast) and system-configuration information inside the computer. Even when it is turned "off," it draws enough power to keep the clock/calendar and CMOS memory containing the above information working. When it's unplugged (for example, when it's being moved to another location), internal batteries preserve the clock/calendar status and CMOS memory for up to 20 hours.

The Lisa includes two programmable serial ports and one parallel port as well as three expansion-board slots, each of which connects directly to the system bus and has direct memory access (DMA) capabilities. Because none of these slots is filled in any "basic" configuration of the Lisa, they are available for future expansion (unlike the IBM Personal Computer's five slots, most or all of which are used for much-needed video-display and memory cards). Other features include a built-in speaker and a real-time clock (which can be programmed to execute tasks or turn the computer itself on or off at a given time), a microprocessor-controlled detachable Selectric-style keyboard, and a mouse.

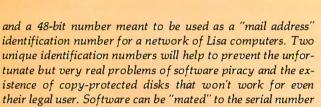
I must thank Apple for including something I've wanted to see for a long time: unique serial numbers encoded into memory. The Lisa has two of these: an actual serial number



The Lisa keyboard.



The Lisa floppy-disk drive, along with the special floppy disks it uses.



of a given machine so that it can be backed up endlessly but will not run on another Lisa computer. True, a persistent few will outwit even this scheme, but it will practically eliminate a manufacturer's sales losses from copied software.

An interesting aspect of

the Lisa is that it abandons hardware graphics chips like the NEC 7220 for system software that requires the 68000 microprocessor to generate and maintain the video image. At first, I questioned the wisdom of this decision because it makes the 68000 assume a heavy computational burden that could be transferred from software to hardware. But according to the designers, the use of a dedicated hardware graphics chip would itself limit and slow down the system (for a discussion of this, see the interview on page 90). In particular, the 68000 clock was set at 5 MHz instead of the usual 8 MHz to give the hardware just enough time to access the 32K bytes of screen memory during the machine cycles in which the 68000 is not using the address lines. This gives the Lisa access to the video memory that is transparent to the 68000 (hardware



Inside the Lisa computer. Note the three connectors for expansion boards.

graphics chips severely limit access to the video memory) and results in a static-free image. (Much of the static or "hashing" in graphic video images results from the system accessing the video memory while the circuitry is using it to generate the video image.)

Apple will also be offering the Apple Dot Matrix Printer

and the Apple Letter Quality Printer. Apple's engineers tested many existing printers, chose two (from C. Itoh and Oume, respectively) that best met their needs, then had the companies produce modified versions with Applespecified hardware and soft-

ware changes. Apple needed such exacting print quality because the Lisa software is very demanding of both printers. For example, both printers will reproduce almost exactly both the text and graphics that can be displayed on the Lisa screen. In addition, Apple has created special print wheels for its Letter Quality Printer so that you can print normal. italic, underlined, and bold characters without changing print wheels (quite a nice move—who's going to change print wheels several times a page just to get true italics?). The amazing thing about the Apple Dot Matrix Printer is that Apple plans to sell it for around \$700 (the Letter Quality Printer will sell for about \$2100). Unfortunately for Apple II and III owners, these printers' tricks are done entirely in software on the Lisa and won't transfer to other Apple computers.

Ease of use is the first thing that a novice **Lisa** user experiences.

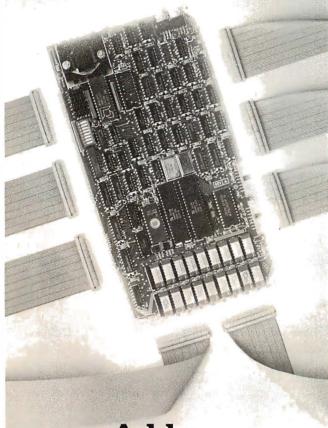
A reproduction (at 80 percent) of printing from the Apple Dot Matrix Printer.

disks - and a given level in error is correctable by data in the next lower level. On the block level, each 512-byte block of data has a 24-byte area of hint bytes. These identify the file to which the block belongs and its block number within the file. On the file level, each file contains a header that duplicates information in the disk catalog. On the disk level, each floppy disk keeps a file of information about the status of each file on the disk. The Lisa system software automatically tries to reconstruct

information that is lost, so it recovers from errors that would halt other computers.

Psychological reliability is the kind that makes an office worker secure. The Lisa floppy-disk drive is unique in this respect. On the Lisa computer, you can't yank your floppy disk out any time you want to (if you could, you might, for example, remove the disk before files on it are updated). Instead, you press the Disk Request button beside the disk-drive slot. The software in the Lisa com-

When one terminal is not enough



Add a MuSYS Slave!

Expand your Z80A/S-100 based micros with MuSYS slaves and TurboDOS*. Our NET/82 slave board has everything you need for another station: Z80A CPU, up to 128K bytes of RAM. two serial ports, a priority interrupt controller, memory parity checking, and many other features. There isn't a more cost-effective way to add complete, hardware-isolated network slaves to your system. And TurboDOS makes it even better. It's faster than CP/M® * for systems functions, supports larger files (134 MB) and disks (1048 MB), and unlike CP/NET* it's compatible with nearly all 2.2 applications software. Many features which are optional, extra-cost, or not available at all in CP/M are standard with TurboDOS. Call today for all the details. Generous dealer/OEM discounts available.

*TurboDOS is a trademark of Software 2000, Inc.: CP/M and CP/NET are trademarks of Digital Research, Inc.; NET/82 is a trademark of MuSYS Corp.



1752 B Langley Irvine, CA 92714 (714) 662-7387 TWX: 910-595-1967 CABLE: MUSYSIRIN puter checks your work space, closes any files belonging to that disk (thus updating the file), then ejects the floppy disk so you can remove it.

A similar thing happens when you turn the Lisa "off" (actually, it's never completely off; it just goes into a low-power mode). In any case, when you hit the Off button, system software automatically closes all open files, thus transferring the information in them to their respective floppy disks, and releases the disks from the Lisa disk drives. In addition, the software records the status of the "desktop" so that, when the computer is reactivated, Lisa automatically returns it to the appearance and state it was in when the Lisa was turned "off." Although those who have worked with computers before will find these features hard to get used to, most newcomers will be reassured by them.

The design of the Lisa application programs (which are the only things most Lisa users will see) is another example of psychological reliability. Many people have vague fears of computer programs because they think they'll do something wrong and cause a catastrophe that will make them look foolish. This won't happen with the Lisa system for two reasons. First, the Lisa software is designed to be very understandable. The metaphors make people comfortable with the manipulation of data, error messages are both clear and complete and tell you what alternatives you have, and, in general, the programs let you know where you stand and the consequences of a given action. Second, the Lisa computer has the "Undo Last Change" command mentioned earlier. With this command, even the most uncertain users will not hesitate to act in a way they think is appropriate. The way Lisa programs work, the user probably is right, and if he isn't, he knows he can undo whatever happens. People who won't trust most computer programs will trust Lisa programs.

Communications and Databases

As the engineer I talked to pointed out, no computer is going to be the most important piece of equipment in an office unless it can easily interact with other computers. This need has been integrated into the design of the Lisa system in several ways.

First, a communications program called Lisa Terminal allows the Lisa computer to emulate several popular terminals (Digital Equipment Corporation's VT52 and VT100 terminals and Teletype Corporation's ASR-33). The Lisa Terminal program includes all the options that a given terminal allows, even down to simulated status lights. A future Apple terminal program will enable the Lisa to emulate the IBM 3270 family of terminals.

Second, Lisa computers can be connected together via a new local network called Apple Net, which Apple hopes to promote as an industry standard because it feels that other networks have major cost or performance problems. According to Apple, Apple Net meets four criteria that it thinks are important: it can be easily installed by the user, it is highly reliable, it is easily extendable to include more nodes or to interface with other networks (like Ethernet and other Apple Net networks), and it has a low per-node

TIME SPECTRUM®

Only the new TIME SPECTRUM brings you a galaxy of expansion options for your IBM-PC[®] with the new VERSAPAK[®] family of expansion modules.

SYNCPAK SYNCHRONOUS EXPANSION

MODULE - Adds two serial synchronous

COMPAK SERIAL EXPANSION ports to the foundation module.

MODULE - Adds a second serial asynchronous port to the TIME SPECTRUM foundation module.

SNAP ON STANDOFFS -For mounting VERSAPAK modules to foundation

modules.

RAMPAK MEMORY
EXPANSION MODULE -

Adds memory expansion to 512KB and an optional second serial asynchronous port to the foundation module.

CLIFFHANGER®Proprietary
connector mounting
hardware simplifies installation
of I/O lines.

Watch for new VERSAPAK modules to be introduced soon.

For more information on the revolutionary new **TIME SPECTRUM** and **VERSAPAK** expansion modules, see your nearest IBM-PC authorized dealer or contact:

475
64KB RAM, calendar clock, 1 serial port installed.

TIME SPECTRUM FOUNDATION MODULE -

Contains a Real Time Clock, 64KB RAM

(expandable to 256KB), serial asynchronous port, optional

parallel printer port, and interface connections for **VERSAPAK** modules.

PERSYST

15801 Rockfield, Ste. A. Irvine, CA 92714 714-859-8871

Circle 335 on inquiry card.

IBM-PC is a trademark of International Business Machines Corp.
Copyright Personnel Systems Technology, Inc. 1982

(under \$500) cost. A-Net has a bandwidth of 1 megabit per second, can have up to 128 nodes, uses a shielded two-conductor wire for interconnecting nodes, and can have a maximum node-to-node distance of 2200 feet. Apple Net uses the same method as Ethernet to avoid message collisions (CSMA/CD—carrier-sense, multiple access with collision detection) and is compatible with the Ethernet on the top five of the seven levels of communication protocol. For those who want it, though, Apple will also make Ethernet interfaces available at a cost of about \$1500 per node.

Third, Apple has distant plans to make it possible for Lisa computers to talk to non-Lisa computers and to shared or remote databases. Although the people at Apple did not discuss specific products, they told me enough to assure me that they are planning extensions in this direction that will make it even more useful.

When these items are available for the Lisa, Apple will have overcome a very big problem: really integrating the computer into the full office environment. That usually includes both local and remote computers. Whatever the needs of a given office, the above products ensure that the Lisa computer will be as useful as any other "office automation" product available from other companies.

Service

The people I talked to at Apple made it clear that, with regard to Lisa, they were going to offer better service options than any other computer company, including IBM, DEC (Digital Equipment Corporation), and Wang. A diagnostic program called Lisa Test (supplied with the Lisa) enable it to isolate the computer failure to a single board or component; in the case of severe problems (when the disk drives aren't working, for example), a built-in test program that runs whenever the Lisa is turned on will diagnose and report on the problem. As I mentioned before, the Lisa is designed so that you can take it apart without tools (a detailed manual explains how).

Apple offers several service options. If you have onsite service (available through a joint agreement with RCA), you simply call Apple and let a service person fix the problem. For large-quantity customers, Apple can provide training to teach employees how to do in-house repairs. For individuals, Apple Care Carry-In Service is available.

In addition, Apple is planning what it calls Direct Phone Support. For a yearly fee, the user will have access to a toll-free number that is answered by a highly trained support person. Apple has high standards for this service, and I'm sure that, once the service has started and is running smoothly, Apple will deliver what it promises. The company expects its representatives to answer 90 percent of the calls received; people whose problems cannot be answered immediately will be called back when the answer is found. If equipment needs to be repaired, the Direct Phone Support person will call the

computational value through unequalled performance



A LMC MC68000 system with 1.5 megaliytes of error-correcting RAM.

The Logical MicroComputer Company

The Logical MicroComputer Company 16-bit microcomputers are general purpose computer systems designed for maximum performance and reliability using state-of-the-art technology. Our systems bridge the gap between single-user personal computer systems and much more costly minicomputers. They are ideal for applications requiring either more processing power or more memory than "personal" computers. In addition, they support many more users simultaneously—for example, LMC systems can support up to 32 users simultaneously and soon will be available with virtual memory. With approximately ten times the throughput of the older 8-bit microcomputers, they are suitable for tasks ranging from pure engineering and scientific applications (arithmetic processing and process-control) to business applications requiring multiple users or large data files. And, since these systems are the most expandable microcomputers available, they are an excellent choice for any application where future growth in computational requirements is likely.

140 South Dearborn, Chicago, Illinois 60603 USA, 312.580.0250 Write or call for LMC's product brochure or technical specifications.

BASF QUALIMETRIC* A TOTALLY NEW DIMENSION OF QUALITY.



From BASF comes a totally new level of excellence in magnetic media-the Qualimetric standard, a standard so advanced that BASF FlexyDisks® are confidently backed by an extraordinary new lifetime warranty.* The Qualimetric standard is maintained without compromise through every step of BASF design, production, inspection, and testing ... reflecting an unwavering BASF commitment to media fidelity and durability.

Our FlexyDisk jacket incorporates a unique two-piece liner that not only traps damaging debris away from the media surface, but also ensures precise media-to-head alignment. The result-certified 100% error-free performance, backed by BASF's exclusive lifetime warranty.*

For information security, tomorrow and beyond, look for the distinctive BASF package with the Qualimetric seal. Call 800-343-4600 for the name of your nearest supplier.

Circle 44 on inquiry card.

appropriate repair people and dispatch working modules, so that one call will usually solve the problem. Different support-option plans available will range from 9 a.m. to 5 p.m. weekday service to 24-hour-a-day, 7-day-a-week call-in support. Apple also plans to provide software revisions and support through this option, although details had not been decided on at this writing.

Documentation and Training

I have seen only drafts of miscellaneous pieces of Lisa documentation, but they indicate that the final documentation will be superb. Apple plans to provide the *Lisa Guide*, an interactive teaching program about the Lisa system, and reference books for each application package; each reference book will begin with a short tutorial section that will get users doing useful tasks in under half an hour. Other documentation may be included, but the information was not available at the time we went to press.

Even though the Lisa is meant to be a very easy product to use, Apple will provide training to make sure that people learn how to use it. As one Apple spokesperson put it, "Training is part of the Lisa product." Apple will offer extensive training to all Apple dealers and to selected groups from companies that make large-volume Lisa purchases. Apple will also make training kits available to multiple-unit purchasers to help them train their

THE TEACHER PC For Your BASIC Viewing The complete teaching package for your use of the IBM Personal Computer. em.A.
Presents Lessons in BASIC • Lessons in Data Processing • IBM Manuals Guide • "Computer Lingo" exposed • Hardware "HOW TO" • Home Study Guide Office Reference Manual ... and Much More MICRO COMPUTER DIVISION 55722 Santa Fe Trail Yucca Valley, CA 92284 (619) 365-9718

employees. Individual Apple dealers may offer additional special training.

Future Plans

In the microcomputer industry, products are generally announced early (sometimes before they are designed) and released in preliminary versions before all the features have been integrated into them. Apple is to be commended for resisting this practice. In fact, the company seems to have released a more complete first version of the Lisa than most companies do with their products; the first Lisa sold will be a fine machine.

However, the ambitious and talented people who designed and implemented the Lisa computer have already envisioned and planned for quite a bit more than they can implement by release date. I'm sure they have some ideas they don't want to publicize (and rightly so), but here are some things they were willing to talk about:

•By 1984, Apple plans to replace its 512K-byte memory card (two of which can be fitted into the Lisa computer) with 1-megabyte cards, thus increasing the memory capacity from 1 to 2 megabytes.

As for languages, Apple plans to introduce versions of BASIC, Pascal, COBOL, and even the language/ operating system Smalltalk as soon as possible, and others will follow.

- •As soon as possible, Apple plans to introduce versions of BASIC, Pascal, and COBOL for the Lisa. The BASIC will be compatible with Digital Equipment Corporation's BASIC Plus (unlike IBM Personal Computer BASIC, it will be able to use the extra memory above the first 64K bytes). The first releases of these languages will be "plain vanilla" versions that don't interact with the computer's special features (e.g., mouse control of the cursor, windows, the "desktop" metaphor), but later versions will probably integrate these languages into the Lisa system.
- •Another language that will be available for the Lisa computer is Smalltalk. I was pleased to see Smalltalk working on a Lisa computer—a year and a half has passed since our special Smalltalk issue in August 1981, and no commercially available computer to date has used it. Smalltalk on the Lisa computer will change that. It is a very "possessive" language that directly controls the machine it is implemented on, so it will probably never be integrated into the Lisa environment—but then, it doesn't need to be.
- •Smalltalk is just one example of a language/operating system that can occupy the Lisa machine. The Lisa will also support Digital Research's CP/M family of operating systems and Microsoft's Xenix (a licensed version of Unix that includes business-related extensions). Outside developers will be encouraged to carry operating systems

CP/M GRAPHICS

Your ticket to success.

Take the lead in microcomputer applications with powerful graphics software from Digital Research. CP/M and GSX are the keys to your graphic future. GSX is a logical extension of CP/M which many OEMs are adopting to standardize graphic device I/O. Computers with GSX allow your programs to take advantage of integrated graphic displays and peripherals like plotters, printers and CRT terminals. Together, CP/M and GSX deliver the same vital portability for your programs and data that has made CP/M the most accepted operating system in microcomputer history.

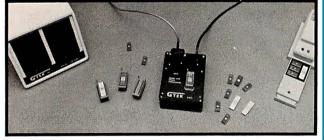
libraries can be linked with CBASIC® Compiler, Pascal/MT +,™ PL/I and FORTRAN on 8- and 16-bit systems. When you put it all together, the Digital Research graphics family is the most complete system you can buy for development and execution of graphic-oriented applications. Whether you're an application developer, OEM or user of microcomputers, call Digital Research for your ticket to graphic success. (408) 649-5500, 160 Central Ave. Pacific Grove, California 93950.



across—one such possibility is Softech Microsystems' UCSD p-system.

- •Apple will be making enhancements to the existing Lisa application programs. On first release, the only limitation in sharing data among Lisa application programs is that you won't be able to "paste" graphic images into a Lisa Word text document (you can, however, add text to a Lisa Draw drawing). Bruce Daniels, one of the Lisa designers, told me that the design allows for adding graphics to a text document but that they simply can't implement the feature in time for the first software release. It will be added by the next release.
- Apple is very conscious of the fact that the success of the Lisa will be heavily influenced by the availability of good third-party software. To encourage such software, the company will make available a "programmer's toolkit" package of software and documentation sometime this year. This toolkit will give third-party programmers all the information they need to build on the considerable utility software (window-control, disk-accessing, intelligent graphic-redrawng, and memory-management routines, for example) already available in the Lisa operating system. (The operating system itself is about half a megabyte of code, though only 200K to 300K bytes of it are resident in memory at the same time.) In addition, the toolkit will list the user-interface conventions that were used to create the existing six application packages and will strongly suggest that third-party software





- Microprocessor based intelligence for ease of
- use and interrace. You send the data, the 7128 takes care of the rest. RS-232 interface and ASCII data formats make the 7128 compatible with virtually any computer with an RS-232 serial inter-
- Auto-select baud rate.
- Use with or without handshaking. Bidirectional Xon/Xoff supported.
- Devices supported as of DEC 82, NMOS NMOS CMOS EEPROM 2758 2508 27C16 5213 2716 2516 27C32 X2816 8748 8749 2732 2532 C6716 2732A 2564 27C64 2764 68766 27128 8755 8741 8742 8751 8755 48016
- Read pin compatible ROMS also.
- Automatic use of proper program voltage based on type selected,
- Manu driven eprom type selection, no per-sonality modules required. (40 pin devices require adapter)
- INTE L, Motorola and MCS-86, Hex formats. Split facility for 16 blt data-paths. Read, program, and formatted list commands also.
- Interupt driven type ahead, program and verify real time while sending data.
- Program single byte, block, or whole eprom. Intelligent diagnostics discern between aprom which is bad and one which merely

- Verify erasure and compare commands.
- Busy light indicates when power is being applies to program socket.

 Complete with TEXTOOL zero insertion force socket and integral 120 VAC power supply. (240 VAC/50HZ available also)
- High Performance/Cost ratio,

 ••• Model 7128 PRICE \$389.00 •••

MODEL 7128 SOCKET ADAPTERS MODEL 481 allows programming of 8748, 8749, 8741, 8742 single chip processors, Price \$98,00

MODEL 511 allows programming the 8751, Intel's high powered single chip processor.
Price \$174.00

MODEL 755 allows programming the 8755 EPROM/IO chip

MODEL 7128/24 - budget version of the 7128. Supports 24 pin parts thru 32K only, Upgradable to full 7128 capacity,
Price \$289.00

Non-expandable, very low cost models avail-

able for specific devices.
MODEL 7128-L1 for 2716 only \$149,00 MODEL 7128-L2 for 2732 only \$179.00

Also evailable from stock:

Eprom Erasers UVP model DE-4 . . \$78.00

Avocet Systems Cross Assemblers \$200.00

RS-232 Cable Assemblies \$25.00 r rogrammable Devices call Complete development systems . \$3240,00

Post Office Box 289 Waveland, Mississippi 39576 (601) 467-8048

will be better received (by both Apple and the consumer) if it follows these conventions. The Apple-generated application programs are so wonderful that most programmers will consider it an achievement to create similar software.

Caveats

I wrote this article after working with a Lisa computer for several hours and studying various Lisa documents. The application packages were completely functional, but I was told changes were still being made to them. The released versions of software may be faster because debugging aids were probably slowing down the version I saw.

Performance

The Apple Lisa was faster than I remembered a similar machine being (an experimental Xerox machine running Smalltalk) and faster than I expected it to be. Granted, a 68000 microprocessor is in the computer, but it was being asked to do a lot – including the manipulation of 32K bytes of video-display memory. Objectively, I must report some delays (30 seconds, maybe) when loading in files, but these were shorter than what I usually encounter using CP/Mbased business programs. In any case, I didn't notice any delays while actually using a given program, which is where you spend most of your time, anyway. I expect that the Lisa computer you'll see in Apple showrooms will be slightly faster than the one I saw.

Conclusions

As you can tell, I am very impressed with the Lisa. I also admire Apple for deciding to make the system without being unduly influenced by cost or marketing constraints. The Lisa couldn't have been developed without such a deep commitment, and no other company I can think of could afford such a project or would be interested in doing it this way (the Lisa project reportedly cost over \$50 million and used more than 200 person-years of effort!). In terms of the actual, as opposed to symbolic, effect it will have on both the microcomputer and the larger-computer market, the Lisa system is the most important development in computers in the last five years, easily outplacing IBM's introduction of the Personal Computer in August, 1981.

As this went to press, Apple announced that the Lisa will be sold in one configuration only: the computer with 1 megabyte of RAM, two floppy-disk drives, the Profile hard disk, the six application programs (Lisa Draw, Lisa Write, Lisa Project, Lisa Calc, Lisa List, and Lisa Graph), and Lisa Test diagnostic program; the price of this package is \$9995; it will be available in the U.S. this spring, and modified foreign-language versions will be available this summer.

Fortunately for us, the history of computing does not stop with the Lisa. Technology, while expensive to create, is much cheaper to distribute. Apple knows this machine is expensive and is also not unaware that most people would be incredibly interested in a similar but less expensive machine. We'll see what happens.■

Bored Waiting? Here's The Board You've Been Waiting For.



Teletek's HD/CTC

A hard disk **and** cartridge tape controller together on one board? Magic? Not really. It's Teletek's HD/CTC. The hard disk and cartridge tape drive controller provide the support necessary to interface both a rigid-disk drive and a cartridge tape deck to the S-100 bus.

A colorful addition to Teletek's already impressive line of S-100 boards, the HD/CTC's specifications include:

 A Z-80A CPU providing intelligent control of the rigid-disk and cartridge tape drives.

- Support of 51/4" rigid-disk drives with transfer rates of 5 megabits per second. Minor changes in on-board components allow the support of other drive types/sizes and transfer rates up to 15 megabits per second. (Interface to disk drive is defined by software/firmware on board.)
- Controller communications with the host processor via 2K FIFO at any speed desirable up to the limit of 2 megabytes per second for a data block transfer. Thus the controller does not constrain the host processor in any manner.
- Two 28-pin sockets allowing the use of up to 16k bytes of on-board EPROM and up to 8k bytes of on-board RAM.
- Individual software reset capability.
- Conforms to the proposed IEEE-696 S-100 standard.
- Controller can accommodate two rigid-disk drives and one cartridge tape drive. Expansion is made possible with an external card.

Teletek's HD/CTC Offers A Hard Disc Controller, Plus Cartridge Tape Controller,

All In One Board.

TELETEK

9767F Business Park Drive Sacramento, CA 95827 (916) 361-1777 Telex #4991834. Answer back-Teletek

Here's just a taste of our great prices.

To really feast your eyes, send for our catalog.

16K RAM KITS1	13 95	RIBBONS FOR MX-10024.00	SUPERFAN II	2710 4 SERIAL 1/0279.
		C-ITOH F-10 40 CPS PARALLEL,1390.00	SUPERFAN II W/ZENER84.50	2718 2 SERIAL / 2 PARALLEL I/0 269.
Set of 8 NEC 4116 200 ns. Guaranteed	one year.	C-ITOH F-10 40 CPS SERIAL	RANA CONTROLLER104.00	2720 4 PARLLEL I/O199.
DICKETTEC		C-ITOH PROWRITER PARALLEL480.00	RANA DRIVE ELITE 1335.00	2810 Z-80 CPU259.
DISKETTES		C-ITOH PROWRITER SERIAL590.00	SNAPSHOT119.00	CIEDDA
ALPHA DISKS	21.95	EPSON MX-80 W/GRAFTRAX PLUS\$CALL	GRAPPLER +	SIERRA
Single sided, certified Double Density 4	10 Tracks,	EPSON MX-80 F/T W/GRAFTRAX PLUS\$CALL EPSON MX-100 W/GRAPHTRAX PLUS\$CALL	7710A ASYNCHRON, SER. INTERFACE.149.00 7712A SYNCHRON, SER. INTERFACE159.00	COMPUTER PRODUCTS
vith Hub-ring. Box of 10. Guaranteed	one year.	EPSON GRAFTRAX PLUS	7742A CALENDAR CLOCK	S-100 PROM PROGRAMMER A/T240.
SCOTCH 3M		COMREX CR-1 PARALLEL839.00	7728A CENTRONICS INTERFACE105.00	S-100 PROM PROGRAMMER KIT195. S-100 PROTOTYPE MODULE SEMI KIT90.
S.S.D.DEN 40 TRK	23.50	COMREX CR-1 SERIAL859.00	APPLE VISION 80-80 COL CARD259.00	5-100 PROTOTTPE MODULE SEMI KIT, 90.
D.S.D.DEN 40 TRK		COMREX TRACTOR FEED109.00	APPLE 8" DISK DRIVE CONTROLLER549.00	MODEMO
VERBATIM DATALIFE		IDS PRISM 80 859.00		MODEMS
		IDS PRISM 80 W/ COLOR/OPTIONS1599.00	MONITORS	NOVATION CAT ACOUSTICS MODEM140.
MD 525-01, 10, 16		IDS MICROPRISM 480\$CALL		NOVATION D-CAT DIRECT CONNECT156.
MD 550-01, 10, 16 MD 557-01, 10, 16		NEC 8023A	AMBER 12"	NOVATION AUTO-CAT AUTO ANS,219
MD 577-01, 10, 16		NEC SPINWRITER 3530 P. RO1995.00 NEC SPINWRITER 7710 S. RO2545.00	NEC 12" GREEN MONITOR	NOVATION O-CAT (1200 Baud)619.
FD 32 or 34-9000		NEC SPINWRITER 7710 3. RO2545.00	SANYO 12'' MONITOR (B & W)198.00	NOVATION APPLE-CAT (300 Baud)310.
FD 32 or 34-8000		NEC SPINWRITER 7730 P. RO2545.00	SANYO 12 MONITOR (B & W)198.00 SANYO 13'' COLOR MONITOR402.00	NOVATION APPLE-CAT (1200 Baud)605.
FD 34-4001		NEC SPINWRITER 3500 SELLUM2295.00	BMC GREEN MONITOR89.00	UDS 212 LP (1200 Baud)
		OKIDATA MICROLINE 80389.00	AMOEK COLOR I	UDS 103 JLP AUTO ANS
DISKETTE STORA	GE	OKIDATA MICROLINE 82A	AMOEK RGB COLOR II	HAYES 100 MODEM (S-100)325
		OKIDATA MICROLINE 83A700.00	AMOEK RGB INTERFACE169.00	HAYES SMART MODEM (300 Baud)227
5'4" PLASTIC LIBRARY CASE		OKIDATA MICROLINE 841170.00	TAXAN RGB359.00	HAYES SMART MODEM (1200 Baud) 540
B' PLASTIC LIBRARY CASE		OKIGRAPH 8249.95		HAYES CHRONOGRAPH199.
PLASTIC STORAGE BINDER w/ Inser		OKIGRAPH 8349.95	MOUNTAIN	SIGNALMAN MODEM W /RS-232C85
PROTECTOR 514" (50 Disk Capacity) PROTECTOR 8" (50 Disk Capacity)		MICROBUFFER IN-LINE 32K299.00		
DISK BANK 514"		MICROBUFFER IN-LINE 64K349.00	HARDWARE	TERMINALS
DISK BANK 8"		MICROBUFFER 64K EXPANSION MOD 179.00	CPS MULTIFUNCTION BOARD154.00	
SION BRITTING			ROMPLUS W/ KEYBOARD FILTER165.00	TELEVIDEO 920C830.
NEC PERSONAL		WICO	ROMPLUS W/O KEYBOARD FILTER125.00	TELEVIDEO 950C
		JOYSTICK23.50	KEYBOARD FILTER ROM49.00	ADDS-VIEWPOINT
COMPUTERS		TRACKBALL (Specify Atari or Apple)54.00	COPYROM	HAZELTINE ESPRIT
Call Alpha Byte for our low NEC price	es.	APPLE ADAPTOR (For Joystick)17.50	MUSIC SYSTEM	
ALTOC COMPUTE	n	BOOKS	A/D + D/A299.00	BARE DRIVES
ALTOS COMPUTE	n	BOOKS	EXPANSION CHASSIS580.00	TANDON 51/4 INCH
SYSTEMS		THE CUSTOM APPLE24.95	RAMPLUS 32K160.00	100-1 SINGLE HEAD 40 TRK
Call Alpha Byte for our low Altos pric	282	BASIC BETTER & FASTER DEMO DISK18.00		100-1 SINGLE HEAD 40 TRK
Call Alpha byte for our low Altos pric		THE CUSTOM TRS-8024.95	S-100 HARDWARE	100-3 SINGLE HEAD 80 TRK
ATADI COMPLITED	00	MICROSOFT BASIC FASTER & BETTER24.95		100-4 DUAL HEAD 80 TRK
ATARI COMPUTER	10	CUSTOM I/O MACHINE LANGUAGE24.95	quartered Mo've expanded our line of	
SIGNALMAN MODEM	85.00	TRS-80 DISK & MYSTERIES	C 400 compatible bandware. Here's ivet a	TANDON THINLINE 8 INCH
ATARI 800		MICROSOFT BASIC & DECODED24.95	few of the lines we carry:	848-1 SINGLE SIDE379
ATARI 400 (16K)	\$CALL	APPLE HARDWARE		848-2 DUAL SIDE490
ATARI 810 DISK DRIVE			QT COMPUTER PRODUCTS	TD0 00 1105 :
ATARI 850 INTERFACE		APPLEMATE DRIVE269.00	18 SLOT M/F W/P S 430 00	TRS-80 MOD I
ATARI 410 PROGRAM RECORDER		SUPER CLOCK II	12 SLOT M/F W/CUTOUTS FOR 2-51/41'500.00	HARDWARE
EPSON CABLE		VERSA WRITER DIGITIZER259.00	12 SLOT M/F W/CUTOUTS FOR 2-8".600.00	
MEMORY MODULE (16K)		ABT APPLE KEYPAD119.00	8 SLOT M/F W/CUTOUTS FOR 2-8"550.00	PERCOM DATA SEPARATOR
JOYSTICK CONTROLLER		SOFTCARD PREMIUM SYSTEM569.00	STATIC MEMORY SYSTEMS	PERCOM DOUBLER II W /DOS 3.4159
PADDLE CONTROLLERSSTAR RAIDERS		MICROSOFT Z-80 SOFTCARD249.00		4 DRIVE CONTROLLER P/S259 TANDDN 40 TRK DISK DRIVE W/P.S289
MISSILE COMMAND		MICROSOFT RAMCARD		LNW DOUBLER W/DOSPLUS 3.3,138
ASTERIODS		VIDEX KEYBOARD ENHANCER II129.00		LNW 5/8 DOUBLER W/DDSPLUS 3.418
PACMAN		VIDEX FUNCTION STRIP74.00		MOD III DRIVE KIT W /DRIVES638
CENTIPEDE	32.00	VIDEX ENHANCER REV 0-699.00	SINGLE S-100 BOARD	
PERCOM DISK DRIVE		M & R SUPERTERM 80x24 VIDEO BD315.00		IRM HADDWADE
		M & R COOLING FAN44.95	SUPERQUAD-8820.00	IBM HARDWARE
See Apple-Atari Software.		T/G JOYSTICK44.95	SUPERQUAD-5	SEATTLE 64K RAM +355
		T/G PADDLE29.95		OUADBOARD 64K430
INTEC PERIPHERALS		T/G SELECT-A-PORT54.95		64K MEMORY UPGRADE80
INTEC PERIPHERALS RAM MODULES				
INTEC PERIPHERALS RAM MODULES 48K FOR ATARI 400		T/G TRACKBALL47.50		ALPHA RYTE IRM MEMOR
INTEC PERIPHERALS RAM MODULES 48K FOR ATARI 400		T/G TRACKBALL	CALIFORNIA	
INTEC PERIPHERALS RAM MODULES 48K FOR ATARI 400		T/G TRACKBALL	CALIFORNIA	EXPANSION BOARDS
See Apple-Atari Software. INTEC PERIPHERALS RAM MODULES 48K FOR ATARI 400		T/G TRACKBALL 47.5/ VERSA E-Z PORT 21.93 THE MILL-PASCAL SPEED UP 270.0/ PROMETHEUS VERSACARD 165.00	CALIFORNIA COMPUTER SYSTEMS	EXPANSION BOARDS 256K W /RS-232C349
INTEC PERIPHERALS RAM MODULES 48K FOR ATARI 400	67.00	T/G TRACKBALL	CALIFORNIA COMPUTER SYSTEMS 2200A MAINFRAME459.00	ALPHA BYTE IBM MEMOR' EXPANSION BOARDS 256K W /RS-232C

IBM DISK DRIVES

Alpha Byte's add-on drive kits for the IBM-PC — each kit includes installation instructions.

1 Tandon TM100-1 Single head 40 trk.195.00 1 Tandon TM100-2 Double head 40 trk.262.50 QUENTIN DOUBLE HEAD 40 TRK......289.00

HARD DISK DRIVE SPECIAL

MEDIA DISTRIBUTORS

54" Winchester, cabinet, P.S. controller, assembled and tested. Attaches to your Z-80 CPU system in minutes. Runs on Northstar, Heath/Zenith, TRS-80 Mod II. Apple w/ CP/M*. CCS and others. Hardware must be Z-80/CPM* system. The included self-installing software attaches to your CP/M* system. 6-month warranty. No effect on your present floppy disk system. Includes all cables and installation instructions.

10	MEGABYTES	.2370.00
20	MEGABYTES	.3180.00

ISOLATORS

ISO-1	3-SOCKET	.49.95
ISO-2	6-SOCKET	.49.95

MICRO PRO

APPLE CP/M®

.279.00
.179.00
.174.00
.207.00
.174.00
.109.00

MICROSOFT

APPLE

/ II / CC	
FORTRAN*,	150.00
BASIC COMPILER*	296.00
COBOL *	.550.00
Z-80 SOFTCARO	
RAMCARD	79.00
TYPING TUTOR	17.95
OLYMPIC DECATHLON	24.95
TASC APPLESOFT COMPILER	125.00
ALDS	95.00
MULTIPLAN NATIVE DR CP/M	209.00

IBM SOFTWARE

VOLKSWRITER V 1.2	.145.0
WRITE ON	90.00
EASYWRITER II	.247.00
HOME ACCOUNTANT+	.105.00
VISICALC / 256K	.189.0
SUPERCALC	.179.0
WORDSTAR	.279.00
MAILMERGE	
DATASTAR	.207.0
SPELLSTAR	.174.00
SUPERSORT	179.00
d BASE II	.429.0
SPELLGUARD	.230.0
JFORMAT	39.0
Call for additional IBM software prices.	

APPLE SOFTWARE

MAGIC WINDOW	79.00
MAGIC WORDS	59.00
MAGIC MAILER	59.00
DB MASTER	169.00
DB MASTER UTILITY PACK I OR II	69.00
DATA CAPTURE 4.0/80	59.95
PFS: GRAPH	
PFS: (NEW) PERSONAL FILING SYSTEM	1.85.00
PFS: REPORT	
Z-TERM*	
Z-TERM PRO*	
ASCII EXPRESS PRO	
EASY WRITER-PRO	
EASY MAILER-PRO	
A-STAT COMP. STATISTICS PKG	
BEAGLE BROTHERS UTILITY CITY	
APPLE MECHANIC	
TIP DESK#1	
SUPER TEXT 40/56/77	
LISA 2.5	59.95
TRANSCEND II	
SCREENWRITER II	
DICTIONARY	
GENERAL MANAGER	179.00

VISICORP	
DESKTOP PLAN II	.189.00
VISIPLOT	158.00
VISITREND/VISIPLOT	.229.00

TRS-80 SOFTWARE

NEW00S	/80 2.0 MOD I,III	139.00
LAZY WE	RITER MOD I,II	165.00
PROSOFT	NEWSCRIPT MOD 1.1	II w/labels109.00
SPECIAL	DELIVERY MOD I,II	1119.00

WORD PROCESSOR SPECIAL

(Limited Quantities)

(Ellitted)	Q uantities,
FRANKLIN ACE 10001595.00	EPSON MX 80 FT W/ GRAFTRAX695.00
FRANKLIN ACE SYSTEM DISK DRIVE W/ CONT539.00	NEC HI RES GREEN285.00 SCOTCH 3M DISKETTES44.50
ACE WRITER WORD PROCESSOR129.00	STORAGE BOX2.50
MICROBUFFER II 32K299.00	\$3324

Now \$2392

This system may be modified to your needs. Call for special price quote.

VISICALC	189.0
VISIFILES	189.0
CONTINENTAL SOF	TWARE
G/L	
A/R	
A/P	165.0
PROPERTY MGMT	399.0
THE HOME ACCOUNTANT	59.9
FIRST CLASS MAIL	55.0
CDIME COETIM	

CP/M® SOFTWARE

CHIDEDELLEC

We carry CP/M® software in all popular disk formats. Call for availability and price. Most software also available on IBM.

SUPERFILES170.	UU
THE WORD PLUS117.	00
d BASE II429.	00
OUICKCODE230.	00
DUTIL91.	00
SUPER CALC	
SPELLGUARD230	00
P & T CP/M® MOD 2 & 16 TRS-80175.	00
COMMX TERMINAL PROG82.	50
PASCAL Z349.	00
PASCAL MT +	00
PASCAL/M295.	00
ACCOUNTING PLUS**-	
G/L,A/R,A/P,P/R,1799.	00
CONDOR 1	00
CONDOR II849.	00
BADLIM	00
DIGITAL RESEARCH	
DIGITAL NESEARCH	

DIGITAL RESEARC	Н
MAC	89.00
SID	69.00
ZSID	97.00
PL/ 1-80	439.00
C BASIC 2	96.00
SUPERSOFT	

69.00
89.00
179.00
59.00
59.00
89.00
239.00
78.00

WORDSTAR

MAILMERGE

OATASTAR	.220.00
SPELLSTAR	.150.00
CALC STAR	.195.00
MICROSOFT	
BASIC 80	.249.00
BASIC COMPILER	.299.00
FORTRAN 80	.359.00
COBOL 80	
MACRO 80	.185.00
mu MATH/mu SIMP	.200.00
mu LISP/mu STAR	.165.00

X-TRA SPECIAL DELIVERY MOD I,III 199.00
TRACKCESS MOD I24.95
OMNITERM SMART TERM.MOO I,III,89.95
MICROSOFT BASIC COMP. FOR MOD 1 165.00
LDOS 5.1 MOD I,III

TRS-80 GAMES

INVADERS FROM SPACE.	17.95
PINBALL	17.95
MISSILE ATTACK	18.95
STAR FIGHTER	24.95
Call for more TPS-80 nam	ac

APPLE & ATARI GAMES

Spinnaker in stock, call for prices.

BRODERBUND	
APPLE PANIC	23.61
MIDNIGHT MAGIC	27.26
CHOPLIFTER	27 .20
AUTOMATED SIMULA	ATIONS

AUTOMATED SIMULAT	IONS
INVASION ORION	20.95
STAR WARRIOR	31.35
CRUSH, CRUMBLE AND CHOMP	24.95
TEMPLE OF APSHAI	31.35
HELLFIRE WARRIOR	31.35
RESCUE AT RIGEL	23.36
ON-LINE SYSTEMS	

011	III OI OI EIIIO	
WIZARD	AND PRINCESS	27.26
SOFT P	ORN ADVENTURE	23.36
THRESH	IOLD	31.16
JAW BR	REAKER	23.36
CROSSF	IRE	24.95
ULYSSE	S & GOLDEN FLEECE	25.95
FROGGE	R	24.50
INIEC	COM	

INFOCOM	
ZORK I,II,III	28.00
STARCROSS	28.00
DEADLINE	35.00
EDU-WARE	
COMPU-REAO	24.95
COMPU-MATH FRACTIONS	34.95
COMPU-MATH DECIMALS	34.95

MORE GREAT APPLE GAMES

DAIIN OITIOTAL	
TUBEWAY	27.26
ARCADE MACHINE	32.95
TUES. MORNING QUARTERBACK	25.95
THE SPACE VIKINGS	38.50
COMPUTER QUARTERBACK	31.16
SEA FOX	24.00
THE SHATTERED ALLIANCE	49.95
POOL 1.5	27.26
ULTIMA	31.16
RASTER BLASTER	23.36
FLIGHT SIMULATOR	26.61
INTERNATIONAL GRANO PRIX	25.95
CARCON II	

PINBALL SUBLDGIC	24 50
SPACE KADETT	
SNACK ATTACK	
BUDGECO PINBALL CONST. SET	
THIEF	24.95
MARS CARS	
KAMIKAZI	
THE WARP FACTOR	31.16
COSMO MISSION	23.36
WIZARDRY	37.95
CIDILLO COETIMADE	
SIRIUS SOFTWARE	
SPACE EGGS	
GORGON	
SNEAKERS	
PHANTOMS FIVE	
BANDITS	25.00
EDU-WARE	
PERCEPTION PKG	10.05
COMPU-MATH: ARITHMETIC	
COMPU-SPELL (REO, DATA DISK)	
COMPU-SPELL DATA DISKS 4-8. ea.	
RENDEZ VOUS	
ON-LINE SYSTEMS	
ULTIMA II	
MISSILE DEFENSE	27.26
PEST PATROL	23.36
TIME ZONE	
CRANSTON MANOR	
CANNON BALL BLITZ	25.95
MUSE SOFTWARE	
	20.05
ROBOT WARS	32.95

To order or for information call

THREE MILE ISLAND......31.61

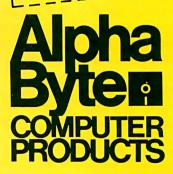
In New York: (212) 509-1923

In Los Angeles: (213) 706-0333

<u>In Dallas:</u> (214)744-4251

By Modern: (213) 883-8976

CALL OUR MODEM LINE FOR WEEKLY SPECIALS.



31245 LA BAYA DRIVE WESTLAKE VILLAGE, CA 91362

Circle 15 on inquiry card.

265.00

.95.00

Ciarcia's Circuit Cellar

Build a Handheld LCD Terminal

A single-line display is quite adequate for many troubleshooting and monitoring applications.

Steve Ciarcia POB 582 Glastonbury, CT 06033

The Circuit Cellar was a lonely place after the tumult of finishing up the complicated and seemingly endless MPX-16 project, which had occupied almost my every waking moment for months. I was dreading a call from my editor at BYTE, who was sure to ask what my next project would be. For once, I was stuck without an idea.

As the wind whistled outside, I decided to check how hard it was blowing. I turned on the radio, expecting to hear a synthesized computer voice describing the current weather conditions, but got only static. I groaned as I realized that something must be wrong with my automatic talking weather station.

The talking weather station was my project exactly a year ago (see reference 1). It combined a single-board Zilog-Z8-based computer with various weather instruments and a speech synthesizer in a machine that could transmit weather information in the form of English speech using a low-power FM radio transmitter. It worked flawlessly through its first New England winter, chattering ceaselessly for many months. I've

Copyright © 1983 by Steven A. Ciarcia. All rights reserved.

Z8 is a trademark of Zilog Inc.

used it to collect reams of data concerning average wind speeds and temperatures on my little hill here in the wilds of Connecticut.

The computerized weather station is only about 50 feet from the Circuit Cellar, but it might as well have been 10 miles. I didn't know if the problem was in the transmitter, the weather instruments, or the computer. To troubleshoot it, I had to drag about half of my test equipment out under the station's lofty perch, find plugs for everything, and balance a Televideo 925 video terminal on the fender of my truck.

But matters turned out to be not so bad as I had feared. Once the equipment was set up, I had little trouble; it took only a single line of output displayed on the terminal to diagnose the problem, which was easily remedied. And as I carried the equipment back to its home, I realized that I had an article idea.

Analyzing the Problem

Not all computer troubles are so simple that they can be diagnosed by one line of display, but many are. I had found it necessary to drag out an AC-powered 24-line by 80-column terminal to observe just the one line. But wouldn't it have been nice to have a portable one-line terminal for such simple situations? I could have saved the heavy stuff for applications

requiring a more complex display.

The Z8- (actually Z8671-) based brain of my weather station, if you will recall, is the Z8-BASIC Microcomputer (a device sometimes called the Z8-BASIC Computer/Controller or simply the Z8 board), presented in the July and August 1981 Circuit Cellar articles (see reference 3). Since that time, many of you have built Z8 boards (mostly by using the kit available from The Micromint) and reported to me on how you are using them. The feedback I get is that many **Z8-BASIC** Microcomputers are being used in dedicated control or datareduction applications in which a terminal is often not required, or if one is attached to the system, it only monitors the system's functions, perhaps displaying error codes or computed results.

A Portable Terminal

Why not small displays for small computers? For many years, experimenters had only 6-digit LED (light-emitting diode) hexadecimal displays. Is there nothing between this and a full 24 by 80 terminal?

This month I'd like to present a relatively simple project that might serve to fill the gap between little hexadecimal displays and full-function terminals. The Circuit Cellar Handheld LCD Terminal consists of a single-line 16-character liquid-crystal

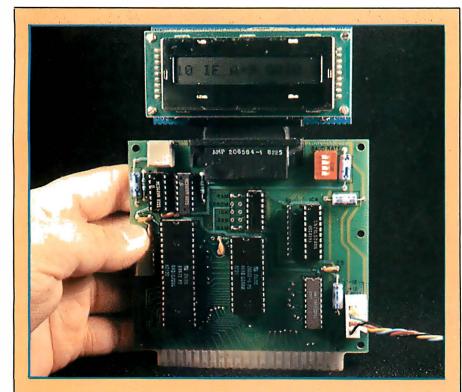


Photo 1: The Circuit Cellar Handheld LCD Terminal installed on a **Z**8-BASIC Microcomputer system.

display (LCD) with additional components added to form a full-duplex serially interfaced computer terminal suitable for attachment to any small control computer. The CY300 LCD-controller integrated circuit from Cybernetic Micro Systems encapsules the entire display circuitry in a single chip and requires only 15 mA (milliamps) at 5 V (volts). Two additional chips are required to convert TTL (transistor-transistor logic) voltage levels to RS-232C voltage levels.

The display can be configured for serial or parallel input, and by attaching a parallel ASCII (American National Standard Code for Information Interchange) keyboard, you can configure a complete terminal for the Z8-BASIC Microcomputer (or some other small computer). The unit (excluding the keyboard) measures 3½ by 1½ by 1½ inches.

I'd like to start by discussing the CY300's general features, and then we can look at a description of a terminal built using the CY300.

Cybernetic Micro Systems CY300

The CY300 Dot-Matrix LCD Controller is designed to provide an easy-to-use peripheral device that displays ASCII characters and allows cursor editing operations. The CY300 provides several modes of operation to provide various levels of display capability. Its pinout specifications are shown in figure 1a on page 56.

The CY300 is a TTL-compatible CMOS (complementary metal-oxide semiconductor) 40-pin device configured to control 16-character alphanumeric dot-matrix liquid-crystal displays that use the Toshiba T3891 LCD-driver chip, as shown in the block diagram of figure 1c on page 56. The CY300 accepts parallel and serial data inputs and can generate 64 different ASCII characters, as shown in figure 2 on page 57.

A blinking-block cursor normally indicates the position in the display where a character will next appear, but the cursor can be moved to

highlight a particular character. The CY300 displays the characters it receives, storing them in a buffer until it gets a Return character. It then outputs the contents of the buffer on a serial channel. The CY300 is designed to drive a console display for small microcomputers, and as I have suggested, such a display can be used to replace a CRT (cathode-ray tube) terminal in many systems.

The CY300 contains the circuitry to perform several different functions. Two types of input interfaces are offered. The first is a parallel input port. You can connect a keyboard to this, which will enable you to enter commands or messages to the display and make typing corrections before sending the text out to the host computer. In simple display-only applications, the parallel input can be used to generate display messages.

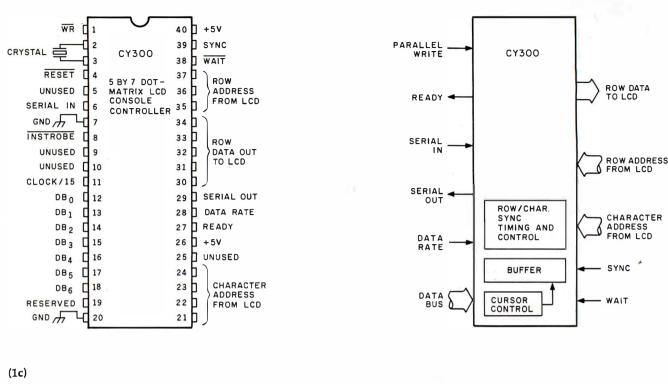
The second interface is a serial data link, consisting of two lines, a serial input and a serial output. Generally, the host computer would be connected to these lines, with the serial output used to send short strings of characters (entered from the parallel keyboard input) to the computer, and the serial input used to receive messages or responses from the computer. The serial interface operates at 5-V logic levels only, so connection to an RS-232C port requires the use of external driver and receiver circuits to translate the voltage levels.

The CY300 also contains an internal 32-character line buffer for storing the messages shown on the display and control logic for generating the proper dot patterns for the displayed characters.

Parallel Input Operation

The CY300 can display data from either its parallel or serial input. The general scheme for parallel interfacing of the CY300 is shown in figure 3.

In parallel input, the circuitry sending the data simply places logic states representing the bits of an ASCII character on the 7 lines of the input bus, waits until the Ready line is high, and then lowers the \overline{WR} (write) strobe line. As the \overline{WR} strobe is held low, the Ready line goes low (indicating a busy state) and then returns to



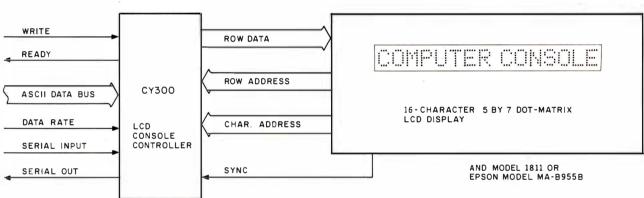


Figure 1: Descriptive information on the Cybernetic Micro Systems CY300 LCD Console Controller. Figure 1a shows the pinout specification of the CY300, 1b is a functional logic diagram of the CY300, and 1c shows a block diagram of a display system using the CY300.

the high state. When the Ready line is high again, the CY300 is prepared to receive the next character by repeating the process.

In manual-input mode, the blinking cursor indicates the location of the next character to be entered. A character can be erased by using the ASCII Rubout code (hexadecimal 7F), which causes the cursor to move left one space; an ASCII space (hexadecimal 20) is then written into the new cursor location.

The cursor can be moved left one position using the cursor-control character Control-A (hexadecimal 01) and can be moved right one position with Control-B (hexadecimal 02). These control characters do not delete any displayed characters but may place the cursor over a character already entered. The cursor always indicates the location where the next character entered will be displayed. Thus if the cursor is over a character that has already been entered, the

next input character will overwrite the existing one, and the cursor will move one position to the right.

Serial Input Operation

The CY300 can accept data from a serial source as well; the setup is shown in the block diagram of figure 4. Unlike the parallel mode, in which the sending circuit waits for a Ready signal, the serial input mode is asynchronous. The normal RS-232C 8-databit format is used for both serial input

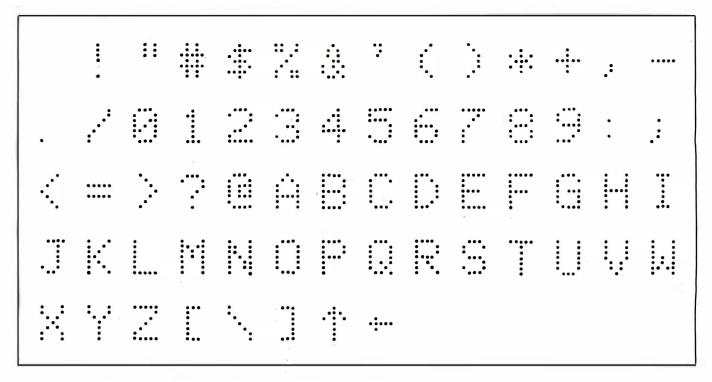


Figure 2: Dot-matrix character set produced by a liquid-crystal display driven by the CY300.

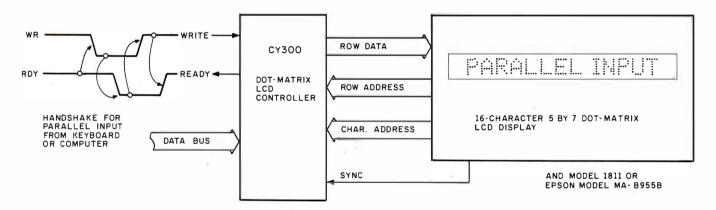


Figure 3: Block diagram of a parallel interfacing and timing requirements for the CY300.

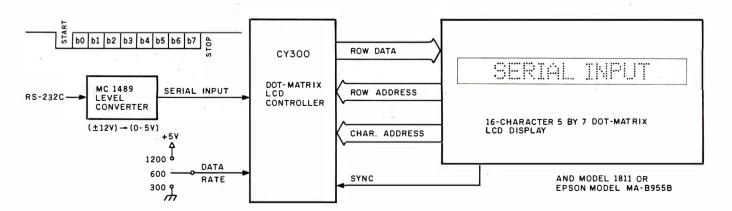


Figure 4: Block diagram of a typical serial-input arrangement used by the CY300.

and output: that is, a low-going start bit, followed by 8 data bits (least significant first, most significant last) and at least 1½ stop bits (1½ bit periods in the high state). After the stop bits have been sent, the CY300 is ready to receive the start bit for the next transmitted character.

The serial communication protocol of the CY300 is compatible with the RS-232C character format. However, the transistor-transistor logic of the CY300 operates between 0 and 5 volts (allowing the CY300 to be powered by a single +5-V supply), and RS-232C interfaces normally operate at ± 12 V, so the serial input and output lines are typically routed through voltage-level translators if the CY300 is to be connected over any significant distance to an RS-232C port. However, in the case where the CY300 and host computer are physically adjacent, they can be connected directly together, operating at 5-V logic levels, without the translator circuits between them.

Other voltage protocols, such as

RS-422A and RS-423A, also can be used for serial communication. These require different driving circuits, but the logical format of the characters is the same for all the common serial protocols, so we need only supply the appropriate driver and receiver circuits for the interface in use. For an RS-232C interface, the MC1488 driver chip and MC1489 receiver chip are the most popular. The CY300 serial output line would be connected to the 1488, while the 1489 would be connected to the serial input line.

The CY300 gives us a choice of three different data rates for the transmission of characters over the serial link. This choice is controlled by the Data-Rate-Select line, pin 28. If the line is connected to +5 V, 1200 bps (bits per second) is selected (the line should be connected directly to the power supply without a pull-up resistor; otherwise, the CY300 may choose the wrong rate). If the line is left unconnected to anything, 600 bps is selected. If the line is connected to ground, 300 bps is selected. These

data-rate selections assume the use of a 6-MHz (megahertz) crystal.

Display Driver Interface

The 16-character display module I chose for this project is not just a bare LCD but includes its own controller/driver circuitry. The CY300 is specifically designed to work with 16-character LCDs driven by the Toshiba T3891 LCD-driver chip or its equivalent. Examples of such displays are the AND Model 1811 and the Epson MA-B955B.

Electronically, the 16-character 5-by 7-dot-matrix display appears to the interface circuitry as 16 sets of 7 rows (each row containing 5 data bits, 1 bit for each dot). The T3891 is designed to coordinate the reception of this row data with the information source and drive a dot-matrix LCD. Thirteen signals passing between the CY300 and the T3891 accomplish this. They are:

Sync: synchronizes dot pattern between T3891 and CY300

ADx lines: 4-bit character-position address from T3891

Sx lines: 3-bit row-position address from T3891

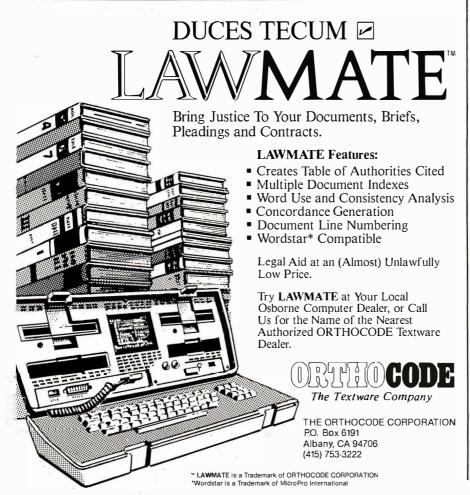
Dx lines: 5-bit row data from CY300 to T3891

The dot-pattern control logic is synchronized to the display's clock signal using the Sync line, which indicates when the display is ready for the next dot pattern. The CY300 uses the row- and character- (column) address information from the display to generate the proper dot pattern, based on its internal character generator and the contents of the line buffer.

When the T3891 begins its display sequence, it merely sets a character and row address of the specific display point. The CY300 examines its display buffer and simply outputs the 5 data bits that should go in that addressed location. Using the T3891 greatly simplifies the LCD interface.

Circuit Cellar Handheld Terminal

Figure 5 is a schematic diagram of the Circuit Cellar CY300-based terminal (shown in photo 2 on page 62).



INCREASE YOUR PRODUCTIVITY WITH OUR WORD PROCESSING KEYBOARD FOR THE IBM PC.

We improved the keyboard and added some features to make your keyboard more "finger friendly".



- Left hand SHIFT key properly placed.
- Lighted indicators on:
 - CAPS LOCK key, NUMERAL LOCK key
- RETURN key in standard typewriter position.
- ENTER key next to ten key pad for adding machine like data entry.
- Sculptured key tops with "finger homing" position on:
 F, J, and 5 key of the ten key pad.

From the design of the case to colors of the keys, to the plug on the cable, the keyboard is 100% IBM compatible. This keyboard is the most productive way you will ever spend \$199.

30 DAY SATISFACTION GUARANTEE

We are so sure you will like this keyboard we will give you 30 days of use to be sure. If you are not completely satisfied return it for a full refund including freight.

TO ORDER BY MAIL SEND:

- -quantity desired @ \$199 each.
- —your name and shipping address
- -daytime phone number
- -add \$5 for UPS 2 day air service
- -California residents add \$11.94 sales tax.
- Company check or credit card and expiry date.
 (Personal checks take 18 days to clear)

TO ORDER BY PHONE:

In California (805) 482-9829 Outside California Toll Free (800) 821-4479 Dealer Inquiries Invited

QUBIE' <u>DISTRIB</u>UTING

4809 Calle Alto Camarillo, CA 93010

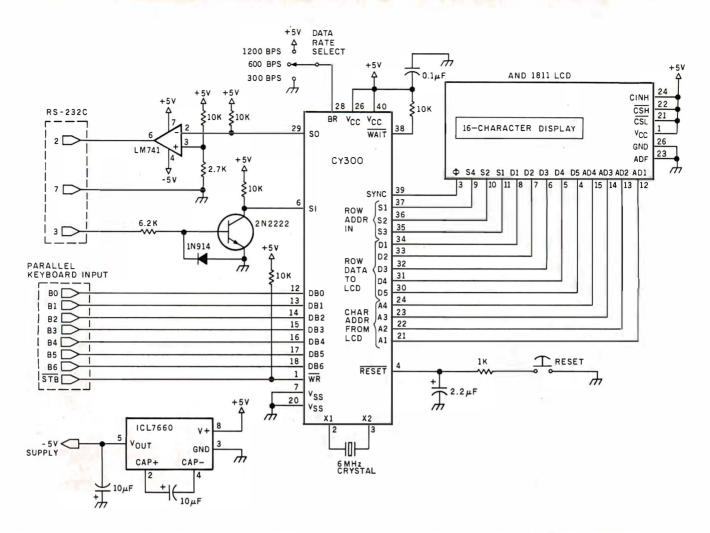


Figure 5: Schematic diagram of a single-line LCD computer terminal built around the CY300 and the AND 1811 display module. This style of RS-232C driver circuit was designed to use minimal ± 5 -V power, so it's not guaranteed to work through a long cable to the host computer.

With minor exceptions, it is configured much like the examples shown in the block diagrams presented earlier. It can function as a serially interfaced display or, if equipped with a parallel keyboard, as a full-duplex ASCII terminal.

In assembling my prototype, I used an AND 1811 display and mounted all the rest of the components behind it (as shown in photo 2b). This specific form of prototype construction was employed so that the finished display could be plugged directly into the RS-232C DB-25 connector on top of a Z8-BASIC Microcomputer.

Normally, when I am connecting a TTL-level device to an RS-232C port, I would install level-converters such as the MC1488 driver and MC1489 receiver in between. The dual-polarity (±12 V) power required for

the driver could be derived from the Z8 board's power supply. However, the useful portability of the terminal would be suspect if it required you to either drag along an extension cord for AC power to a separate power supply or hook up three separate battery cells.

I pondered this impasse briefly and then decided to take advantage of a little-known part of the RS-232C signal specification.

RS-232C signals have two defined states: marking and spacing. The marking state extends from -3 V to -15 V, and the spacing state extends from +3 V to +15 V. The transition region between is undefined. (See Ian Witten's article "Welcome to the Standards Jungle" on page 146 for more information on RS-232C's idiosyncrasies.)

Note that the defined regions of

marking and spacing fall within the 5-V range that TTL parts can generate. Especially for short cable lengths and at low data rates, RS-232C works just fine at these lower voltages. With that fact in mind, I designed this terminal to use as little power as possible, drawing that power from a single +5-V source.

So that it could receive full-voltage RS-232C levels, I used a transistor level-converter on the input line. For output, an operational amplifier (op amp) is configured as a "rail-to-rail" saturation switch, with a -5-V supply provided by an Intersil ICL7660 DC-to-DC-converter chip. This CMOS device converts +5 V to -5 V at currents up to 15 mA. Using this combination of components, the RS-232C output level is generally about ± 4 V.

The major advantage of this ap-



THE TOASTER. TWO REMOVABLE 3.9", 5 MEGABYTE HARD DISK CARTRIDGES MAKES IT THE GREATEST THING SINCE SLICED BREAD!

Now you can start the day by knowing you can get everything you've always dreamed of. In fact, it's the answer everyone's been looking for!

The Toaster, from XCOMP.
The Toaster is a Hard Disk Subsystem with a twist. It contains TWO 3.9", 5 Megabyte Hard Disk Cartridges that are REMOVABLE!

The Toaster provides unlimited storage and convenient back-up with a full 5 Megabytes per cartridge...10Megabytes per application! In addition to XCOMP's quality, reliability and industry leadership, you'll be benefiting from the ultra simplicity of a floppy and the fantastic speed of a hard disk.

And what about security? What can be more secure than being able to pull out your cartridge and take it home with you?

Even though the Toaster is revolutionary, XCOMP

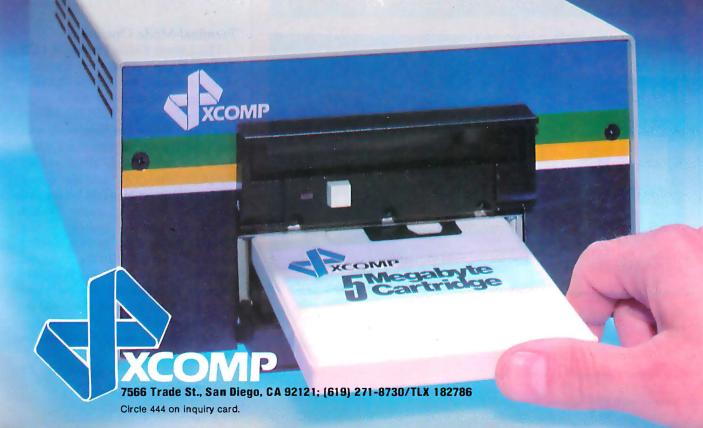
also offers 16-MB Fixed, 5-MB Removable and 8 or 16 Fixed Hard Disk Subsystems. We consider them the best in the industry. **ALL** XCOMP products attach to the Apple II and III, IBM-PC, NEC PC8000, OSBORN,

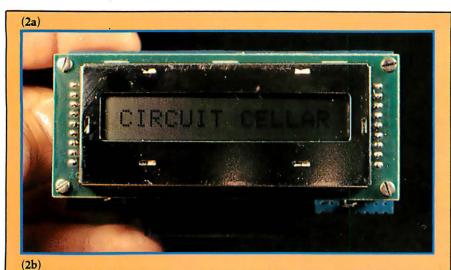
KAYPRO and other popular single-board computers. **The Toaster** is just one of the many ideas coming from the people at XCOMP today.

Tomorrow, who knows what may pop up.

31 SALES OFFICES TO SERVE YOU: Richard Dean & Assoc Woburn, MA (617) 933-8435 Paston-Hunter Company, Inc. Syracuse, NY, (315) 437-2992
EASTERN SEABOARD: TMC Sales Corp., Fort Lee, NJ, (201) 944-8340 / (212) 563-5185,
AB&T Sales Corp., King of Prussia, PA (215) 783-7011 SOUTHEAST: Cartwright & Bean
Atlanta, GA (404) 233-2939 MIDEAST: J. Malcom Flora, Inc., Plymouth, MI (313) 453-4296
Incom Marketing, Inc., Columbus, OH (614) 445-8431, New Horizons Electronic Marketing,
Bannockburn, IlL. (312) 234-5911 SOUTHWEST: J.Y. Schoomaker Co., Inc., Dallas, TX
(214) 349-1650 ROCKY MOUNTAINS: B&B Electronics, Inc., Englewood, CO (303) 773-6700
WESTCOAST: Berman-Graveley Co., Inc., Costa Mesa, CA (714) 549-2122 Moulthrop
Sales, Inc., San Francisco, CA (415) 846-0550. Earl & Brown, Portland, OR (503) 245-2283
MINNESOTA: Please call XCOMP KANSAS: Please call XCOMP.

Special Offer: With every Toaster sold, you'll receive TWO Cartridges FREE! That's a \$150. value! Order now!





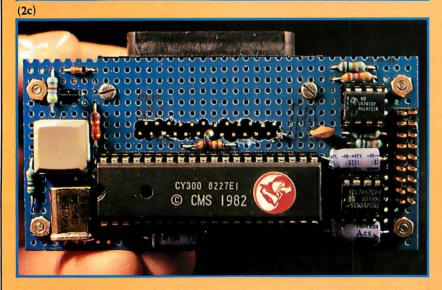


Photo 2: Close-up views of the LCD-terminal prototypes: front (2a), side (2b), and rear (2c).

proach is that it uses only a single voltage with very low power consumption. The terminal circuit requires less than 15 mA (excluding power for the keyboard). Given the power-supply voltage tolerances of the components and the communication line, the entire package could be powered by four 1.2-V nickel-cadmium (NiCd) AA cells (providing a total potential of 4.8 V) or five 1.5-V alkaline cells (6 V total) driving a type-7805 regulator.

Finally, while you might use this handheld terminal just for its display, a keyboard can be attached. The keyboard should present 7 bits of ASCII data in parallel, with the data-ready condition signaled by a negative-going (high-to-low transition) strobe.

There are two ways to correct typing errors: the first is to use the ASCII Rubout character; the second is to use the Control-A and Control-B characters, which move the cursor without modifying the display.

Terminal-Mode Operation

The Circuit Cellar Handheld LCD Terminal can replace a standard video terminal for simple BASIClanguage programming on a computer such as the Z8-BASIC Microcomputer. Using the keyboard, you can type statements into the CY300; these are immediately displayed on the LCD. The CY300 provides cursor editing to correct mistakes before you type the Return character. When Return is typed, the contents of the CY300's buffer (the current display on the LCD) are sent to the computer over the serial channel. If a computer response is called for, the computer sends the response over the serial input channel to the CY300, which then displays the response characters on the LCD.

The normal operation of the Z8

NEC's new letter-quality printer gets personal with IBM.

The Spinwriter[™]3550 lets the IBM PC get down to business.

NEC's new Spinwriter letter-quality printer is the *only* one plug-compatible with the IBM Personal Computer. So you get the business applications you've been wishing for. Letter-quality output for word and data processing. Multi-language, scientific, and technical printing. Simple forms handling. Quiet operation. And the reliability of the industry's most popular printer line.

NEC designed the new Spinwriter especially for the IBM PC. It comes complete with documentation and training materials to fit your PC user's handbook. Just plug the Spinwriter in and your PC instantly becomes more versatile and flexible.

More than 8 forms handlers and 50 print thimbles boost PC versatility. NEC designed the Spinwriter's 8 modular forms handlers to accommodate a wide range of paper and document sizes and

types. The easily mounted handlers let

your computer print out the forms you

need for data processing, word processing, graphics, accounting or other business applications.

The Spinwriter's 50 print thimbles can more than triple your PC's usefulness. They come in both constant pitch and proportional-spaced fonts, plus in foreign language, technical and scientific versions. They snap in and out in seconds, and let you print up to 203 columns on 16-inch paper. They each last for more than 30 million impressions.

This printer's special features make everything look better on paper.

The Spinwriter's software-invoked features include automatic proportional spacing; bidirectional, bold and shadow printing; justification; centering; underscoring; and sub/super scripting, all at speeds up to 350 words per minute.

That big extra, Spinwriter reliability. Spinwriters have the industry's best mean-time-between-failure rating, in excess of 3,000 hours. In terms of average personal computer usage, that's more than five years.

The Spinwriter 3550 is available at ComputerLand stores, Sears Business Systems Centers and IBM Product Centers nationwide.

NEC Information 5 Militia Drive,		BE0283 02173
Send me more information on the Spinwriter 3550.		
Name		
l		
Title	Telephone	
Company		
Address		
City	State	Zip
·,		 P

NEC Information Systems, Inc.

Spinwriter is a trademark of Nippon Electric Co., Ltd.

Circle 295 on inquiry card.



BASIC interpreter is as follows: upon power-up the interpreter sends a userprompting character (a colon) to the console display to inform you that the system is ready for command entry.

You can enter a command or statement at any time by typing ASCII characters into the CY300. The first input from the keyboard (over the parallel channel) will clear the liquid-crystal-display buffer and appear left-justified.

The input line is terminated by a Return character. At the occurrence of the Return, the contents of the display buffer are transmitted to the computer over the serial channel, and then the display buffer is cleared.

Editing Operations

With the keyboard connected to the parallel interface on the CY300, you have the ability to correct typing mistakes before sending commands to the Z8 board (or other host computer). Note that you can no longer edit the command after the Return character is typed, but until then any corrections can be made.

There are two ways to correct typing errors. The first and probably more often employed way is to use the ASCII Rubout character. (On some keyboards this character may be produced by a key labeled "Delete".) When the Rubout character is typed, the CY300 cursor moves one space to the left and replaces the character at that space with a blank. The cursor remains at this new position until another character is entered, allowing you to back up the cursor, remove what has been typed, and reenter the corrected text. Multiple Rubouts will continue moving the cursor to the left, removing any characters that were in the display, until the leftmost position is reached.

The second way to correct typing mistakes uses the control characters that move the cursor without modifying the display. The Control-A character moves the cursor one character position to the left, while the Control-B character moves the cursor one character position to the right. The display is not modified as the cursor is moved. However, if you enter new

characters after moving the cursor, the new characters appear at the current cursor position, overwriting any characters that were there previously. This method of correction allows you to save typing if only a single character need be changed near the beginning of a line. Before typing the Return character, though, you must put the cursor back at the end of the input line, because the CY300 transmits only the characters from the beginning of the display until the character just before the current position of the cursor.

In Conclusion

I don't expect you to junk your video-display terminals after reading this article. Obviously, you'll need a 24 by 80 (or similar size) screen for many purposes. But there are applications for which a portable, battery-operated single-line display is more suitable than a large, full-feature terminal. The sophistication of the CY300 represents a major advance in LCD technology, and I'm sure many of you have applications ready for just such a device.

Oh yes . . . about my weather station. After moving the mountain to Mohammed I was a bit displeased to find that someone had accidentally unplugged the power to the weather instruments. Of course, the problem was not hard to remedy. And if anything like it ever happens again, I'll be ready with my Handheld LCD Terminal.

Next Month:

A new integrated circuit from Texas Instruments makes it easy to build a reliable low-speed modem.

Editor's Note: Steve often refers to previous Circuit Cellar articles as reference material for each month's current article. Most of these past articles are available in reprint books from BYTE Books, McGraw-Hill Book Company, POB 400, Hightstown, NJ 08250.

Ciarcia's Circuit Cellar, Volume I, covers articles that appeared in BYTE from September 1977 through November 1978. Ciarcia's Circuit Cellar, Volume II, contains articles from December 1978 through June 1980. Ciarcia's Circuit Cellar, Volume III, contains articles that were published from July 1980 through December 1981.

To receive a complete list of Ciarcia's Circuit Cellar project kits available from the Micromint, circle 100 on the reader service inquiry card at the back of the magazine.

References

- Ciarcia, Steve. "Build a Computerized Weather Station." February 1982 BYTE, page 38.
- Ciarcia, Steve. "Build a Low-Cost, Remote Data-Entry Terminal." September 1980 BYTE, page 26.
- Ciarcia, Steve. "Build a Z8-Based Control Computer with BASIC." Part 1, July 1981 BYTE, page 38. Part 2, August 1981 BYTE, page 50.
- Ciarcia, Steve. "Make Liquid-Crystal Displays Work for You." October 1980 BYTE, page 24.
- Ciarcia, Steve. "No Power for Your Interfaces? Build a 5 W DC to DC Converter." October 1978 BYTE, page 22.
- Leibson, Steve. "The Input/Output Primer, Part 4: The BCD and Serial Interfaces." May 1982 BYTE, page 202.

The following items are available from:

Micro Projects Inc. POB 420 South Windsor, CT 06074

- 1. Cybernetic Micro Systems CY300 Dot-Matrix LCD Controller chip......\$65

For orders outside the continental United States, please add \$5 for shipping. Connecticut residents please add 7½ percent sales tax.

Sources of liquid-crystal displays are:

AND Inc. 770 Airport Blvd. Burlingame, CA 94010 (415) 347-9916 TWX (910) 374-2353

and

Epson America Inc. LCD Division 23155 Kashiwa Court Torrance, CA 90505 (213) 534-0360 Telex 182412

The manufacturer of the CY300 LCD-controller integrated circuit is:

Cybernetic Micro Systems 445-203 South Antonio Rd. Los Altos, CA 94022 (415) 949-0666

VEDIT-THE CLEAR CHOICE FOR PROGRAMMING

PLUS FEATURES FOR FAST, EFFICIENT WORD PROCESSING

Increasing your productivity is what a good text editor is all about. VEDIT excels with a unique combination of powerful and easy to use editing features, customizability and complete hardware support. Compare VEDIT - you'll find everything you expect in a good editor plus many time saving features which only VEDIT offers.

VEDIT fully utilizes all function keys, or configures to any keyboard layout you are familiar with. VEDIT has helpful aids such as directory display, and you won't loose textifyou run out of diskspace-you can delete files or change disks.

Powerful TECO style command macros let you perform editing tasks you might otherwise not even attempt. Nearly impossible tasks for other editors (such as translations or extensive search/replace on many files), can be done automatically from a command file.

For program development VEDIT surpasses any other editor - with more

extensive file handling, powerful command macro capability and special features for Pascal, PL/1, 'C', Cobol, Assembler and others. VEDIT reduces program editing time by 30% as compared to the best word processor.

For word processing, VEDIT has word wrap, adjustable margins, paragraph reformatting, word and paragraph functions, simple printing and more.

VEDIT supports practically every CRT terminal, video board, 8080, Z80 and 8086 computer. We have been consistently first to support new computers. And we support you with any technical assistance you need.

For the full story, purchase VEDIT risk free. Evaluate the 125 page manual - if you are not satisfied, return the package (disk unopened) for a courteous refund.

Please specify your microcomputer, video board or the CRT terminal version, 8080, Z80, or 8086 code, operating system and disk format.

Compare VEDIT's features:

True Full Screen Editina Edit files one disk in length Automatic Disk Buffering Compact and Fast Display of line and column # Set/Goto text markers 'Undo' key to restore line Automatic Indent/Undent Adjustable Tab positions Repeat function key Text Move and Copy 10 Scratchpad Buffers Load/Save buffers on disk Powerful command macros Directory display Edit additional (small)

files simultaneously
Insert another disk file
Unlimited file handling
Recovery from 'Full Disk'
Change disks while editing
Word Wrap, format paragraph
Simple Printing
Menu driven installation
Startup command file
Setup CRT function keys
Support newest CRT terminals
Support smart CRT functions
Customizable keyboard layout



Introducing GENIE®

Megabyte 5.25" GENIE Winchester Drives

I.B.M. • APPLE II PLUS • RADIO SHACK

5 MEGABYTES \$2295 00

10 MEGABYTES \$259500

15 MEGABYTES \$289500

20 MEGABYTES \$3195 00



Talk about user friendly...

Comprehensive system utilities package.

Allows eight-character names to be assigned to virtual volumes.

User can back-up to either our 5 + 5™ removable Cartridge Drive or to diskettes. Mix & match different system file types on the same disk. System status screen messages.

Up to 16 volumes on-line at a time.

FEATURES

- Precision Manganese-zinc heads
- Average access time 77 ms.
- File sizes 5-20 megabytes
- Power-on self test
- Built-in error detection and correction
- System expandable to eight drives
- Comes complete with all necessary software and hardware
- No preventative maintenance required
- Built-in fan
- Operates 110/220 VAC 50-60 Hz
- One year warranty

*Manufacturer's suggested retail price. Includes all required components. IBM DOS Personal Computer is a registered trademark of IBM Corporation. Apple is a registered trademark of Apple Computer, Inc. Radio Shack is a registered trademark of Tandy Corporation. CP/M and CP/M-86 are registered trademarks of Digital Research.

Excellence in Engineering

Genie Drives were built with the user in mind. A design backed by many years of experience, the Genie Drive is everything a user ever wanted in a hard disk. We offer the ultimate in hard disk mass storage systems that money can buy.

IBM	APPLE II PLUS	RADIO SHACK
• Supports IBM-	• Supports DOS 3.3, CP/M, and PASCAL	available soon
DOS, CP/M-86, PASCAL		S-100
Ultra High		available soon
Speed DMA data transfers Only uses one slot in your	Boot from Hard Disk Can assign Hard Disk vol-	
IBM-PC Allows you to run with up to four floppy disk drives	ume to any slot or drive number in the system	

Available at your local computer dealer

GENIE COMPUTER CORPORATION

31125 Via Colinas #908 • Westlake Village, CA 91362 • (213) 991-6210

Introducing GENIE 1500

5.25" Removable GENIE Winchester Cartridge Drive

IBM • APPLE II PLUS • RADIO SHACK • S-100

The Genie Cartridge Drive is a revolutionary new 10 Megabyte Hard Disk
Drive that includes a 5 Megabyte removable Winchester catridge. The
cartridge Drive system simply plugs into your computer, and includes all
necessary software and hardware. Genie Drives are compatible with most popular software,
and each cartridge replaces

and each cartridge replaces over 30 double-density floppy disks.



FEATURES

- 10 Megabytes of on-line storage.
- File sizes to 5 Megabytes.
- Power-on self-test.
- Easy back-ups in minutes.
- System expandable to eight drives.
- Built-in error detection and correction.
- No preventative maintenance required.
- Comes complete with all necessary software and hardware.
- MTBF 8000 Hours.
- Built-in fan.
- Operates 110/220 VAC 50-60 Hz.
- One year limited warranty.

Only \$399500*



Talk about user friendly . . .

storage media.

Comprehensive system utilities package.

Allows eight-character names to be assigned to virtual volumes.

User Can back-up to any Genie REMOVABLE Cartridge Drive, or to diskettes. Mix & Match different system file types on the same disk.

System status screen messages. Up to 16 volumes online at a time.

Available at your local computer dealer

Manufacturer's suggested retail price. Includes all required components. Concurrent CP/M-86 is a registered trade mark of Digital Research. IBM Personal Computer is a registered trademark of IBM Corporation. Apple is a registered trademark of Apple Computer, Inc. Radio Shack is a registered trademark of Tandy Corporation. Dysan is a registered trademark of Dysan Corp.

GENIE COMPUTER CORPORATION

31125 Via Colinas #908 • Westlake Village, CA 91362 • (213) 991-6210

Circle 182 on inquiry card.

Hardware Review

Apple's Enhanced Computer, the Apple IIe

It's like having an Apple II with all the extras built in.

Robin Moore Warner Hill Rd. RFD #5 Derry, NH 03038

It all began in the summer of 1977 at the West Coast Computer Faire. A fledgling computer company with an unusual name—Apple Computer introduced a new hobby computer called the Apple II. The new Apple II was an impressive machine. It had BASIC in ROM (read-only memory), a built-in Teletype-style keyboard, high-resolution color graphics, and, once the new 16K-bit semiconductor memory devices became available, its memory could be expanded all the way up to 48K bytes. One of the first true home computers, it was completely self-contained, needing only a TV set for a display and a common cassette recorder for data storage.

Today, almost everyone is familiar with the Apple II. It can be found in homes, schools, laboratories, and businesses, and is being used in a wide variety of ways. During the past five years, an entire subindustry has sprung up around it that has, in turn, stimulated further Apple II sales.

It had been obvious for a while at Apple Computer that a replacement for the Apple II was needed. The Teletype-style keyboard, uppercase only 40-column display, and the

About the Author

Rob Moore is a design engineering manager who also maintains a strong interest in FORTH, graphics, and computer music.

maximum of 64K bytes of memory were becoming limitations as the marketplace changed and software became more sophisticated. The design was getting old and technology had changed enough to allow a redesign with significantly fewer parts. A new design could also address foreign requirements for special keyboards, displays, and video signals better than the Apple II. Although the Apple II was a tremendous success, it was clearly time to design a successor.

Enter the Apple IIe

For about the same price as the Apple II, the Apple IIe (e for enhanced) provides a variety of exciting new features and capabilities. Rather than start from scratch and design an entirely new machine, Apple Computer Inc. chose to make a very careful series of enhancements and improvements while keeping the flavor and style of the Apple II. Although completely redesigned internally, the Apple IIe is clearly a member of the Apple II family.

Even though it looks almost the same as the Apple II, the Apple IIe (see photo 1) gives you a great deal more for your money. The base-priced machine includes 64K bytes of memory (expandable to 128K bytes), Applesoft BASIC in ROM, a 63-key keyboard that produces both upper-

case and lowercase characters and has special-function keys, seven expansion slots for I/O (input/output) devices, and a video interface that can display 24 lines in a 40-columnwide format with both uppercase and lowercase characters (this can be easily and inexpensively expanded to 80 columns). In addition to the standard Apple II I/O expansion slots, the main circuit board also holds a special auxiliary connector that is used primarily for various video- and memory-expansion options. Along with Applesoft BASIC, the internal 16K bytes of ROM hold an improved monitor, built-in self-test routines, extended memory-management routines, and an 80-column firmware package with extended editing features that can be used with the 40column display.

The quality of the product is highly

Design Credits

Although it is impossible to give credit to all the people involved, three people deserve special mention. Peter Quinn, the POS Hardware Section Manager, was responsible for the team that designed the Apple IIe. Walt Broedner designed the Apple IIe hardware, including its two custom integrated circuits. Rick Auricchio is Broedner's software counterpart—he modified the original Apple II Plus firmware and added all the new code that is in the Apple IIe firmware.



Photo 1: An Apple IIe system made up of the Apple Monitor III, the Apple IIe computer, and a Disk II 51/4-inch floppy-disk drive.



Photo 2: The rear panel of the Apple IIe. Instead of the plastic slots found in the Apple II, the Apple IIe's metal back panel is designed to mount 9-pin, 19-pin, and 25-pin D-type connectors in precut recesses, providing more reliable connections and reduced RF interference. The built-in game-paddle connector has also been changed to a 9-pin D-type; however, the older-style connector is still available inside the case to accommodate existing devices.

evident. The case is rugged structural foam, the keyboard has a nice touch and dished keytops, and the back panel (see photo 2) has an array of openings that fit the 9-pin, 19-pin, and 25-pin D-type connectors commonly used for serial I/O devices. It appears obvious that the Apple IIe was designed from the ground up to meet the new FCC (Federal Communications Commission) RFI (radiofrequency interference) regulations.

The computer has a metal bottom pan, a metal back panel (rather than plastic as in the present model), and the removable cover is shielded with conductive paint and grounded with metal gaskets at the front and back edges. Some other nice touches include: the "D" and "K" keys (the ones that the middle fingers of a touchtypist's hands fall on) have small bumps on their surfaces; the connector openings on the back panel come

with plastic caps to cover them if connectors aren't installed; the top cover has tabs in the rear to help lift it open. and screw holes to help keep it shut when desired (schools should like this feature).

The Keyboard

The keyboard is the most obvious difference between the Apple II and the Apple IIe. It is essentially an enhanced version of the Apple III's keyboard without the numeric pad; the keyboard on the Apple IIe (see photo 3) has 63 keys, while the Apple II has 53, and the layout is slightly different. Although the changes seem minor, they make the new keyboard significantly easier to use, especially in word-processing or screen-editing applications.

One of the most significant changes is indicated only by the Caps Lock key. The Apple IIe keyboard provides full uppercase and lowercase operation. When Caps Lock is latched down, however, it operates much like the original Apple II keyboard and produces only uppercase characters. If the two solder pads on the main board labeled X6 are connected, programs can check to see if the Shift keys are pressed by reading the PB2 input in the game-paddle port. (This supports a common Apple II modification and many existing word-processing programs.)

To correct a limitation of the old Apple II keyboard, the new keyboard can produce all 128 ASCII (American National Standard Code for Information Interchange) character codes. This was accomplished in the Apple IIe by adding some new character keys, along with Tab and Delete keys, to improve its word-processing capability. (The added keys, with different keycaps, will be used in European versions to provide an ISO [International Organization for Standardization] standard keyboard layout.)

Two interesting additions are the Open-Apple and Solid-Apple keys, which are positioned one on each side of the space bar. If you press Control, Open-Apple, and Reset simultaneously, the Apple IIe will write some arbitrary data into each page of memory and then simulate a power-up

cold start. This eliminates the need to turn the Apple off and then on again to exit a protected program (a definite annoyance), but prevents people from making unauthorized copies of protected software.

Pressing Reset while holding Control and Solid-Apple invokes the built-in self-test software, which responds with "KERNEL OK" if the memory and circuitry pass the tests. Open-Apple and Solid-Apple may also be read individually and used as special-purpose keys by various programs—they are internally connected to the game-paddle port inputs PB0 and PB1. Other improvements include a full set of cursor-control keys positioned to the right of the space bar, auto-repeat on all keys after a 0.9-second delay, and a relocated Reset key. (The Reset key is placed apart from the main keyboard to keep it from being pressed accidentally. In addition, the Control key must be pressed simultaneously with the Reset key to have an effect; this behavior, standard on the Apple IIe, was an option on later models of the Apple II Plus.)

Internally, the keyboard is completely different from that on the Apple II. The Apple IIe keyboard is a simple array of switches—the keyboard-scanning circuitry has been moved to the main printed-circuit board, which also holds a special numeric pad connector, A ROM on the main board maps the keyboardswitch closures into the appropriate ASCII codes and can be changed to provide foreign or special keyboards. (Incidentally, the American version of the ROM is only half used. The other half holds a Dvorak keyboard map that can be accessed with a few jumpers and etch cuts.) For programmers, the keyboard provides an additional "Any key down" flag; it can be read by examining location C010 hexadecimal. This will allow pro-

At a Glance

Product

The Apple IIe computer

Manufacturer

Apple Computer Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010

Components

System Unit Size:

width 15.2 inches (38.6 cm); depth 18 inches (45.7 cm); height 4.5 inches (11.4

Power Required: 107 to 132 VAC, 60 Hz, 60-80 watts

maximum

1-MHz 6502 8-bit microprocessor Processor:

64K bytes of memory; 16K bytes of monitor Memory:

in ROM (includes self-test, Applesoft BASIC,

and 80-column routines)

Standard: keyboard for text and data entry; internal

and external video connectors; 1-bit programmable audible speaker; audio cassette recorder input and output connectors; seven I/O expansion slots to hold peripheral devices and interfaces; external game control connector with four analog inputs and three TTL or switch inputs (similar internal

connector includes three TTL-level outputs) Video Display: Two Uppercase/lowercase Text Modes

•24v by 40h standard

•24v by 80h optional

•character set stored in ROM

Two Standard Graphics Modes

•40h by 48v sixteen-color graphics (40 by 40 with four text lines)

• 280h by 192v bit-mapped array with half-dot-shift logic (280 by 160 with four text lines)—with appropriate software this can provide:

560 by 192 monochrome graphics with

some limitations

280 by 192 monochrome graphics 140 by 192 six-color graphics with some

limitations

Video Outputs:

140 by 192 four-color graphics Both outputs provide NTSC-compatible video, negative sync, 2-V peak-to-peak Keyboard:

Disk Drives:

63 keys for text and data entry; N-key rollover; auto-repeat on all keys (15 Hz) after 0.9 seconds; four cursor-control keys; Caps Lock; two special-function keys; keyboard allows input of all 128 ASCII characters System supports up to six 140K-byte 51/4-inch floppy-disk drives; data is stored using Apple Computer's 6/8 GCR (group-

coded-recording) encoding

Operating System

Apple's DOS 3.3 single-user, single-task, program-driven operating system provides multiple file types, random-access and sequential text files, random disk allocation, individual file protection, and slot-based I/O

Options

Standard options include 80-column text card; extended 80-column text card with 64K bytes of additional bank-switched memory; Apple Disk II floppy-disk drives and controllers

Available Software

Includes almost all existing Apple II software. New software includes Applewriter lle word processor (\$ 195) and Quickfile lle database system (\$ 100)

Hardware Prices

Apple lle main unit	\$1395
Apple Ile system with main unit, Disk II and controller,	
Monitor III, monitor stand, and 80-column text card	\$1995
Apple Monitor III (green screen)	\$249
Apple Disk II (with controller/without controller)	(\$ 545/\$ 395)
80-Column Cards	
(standard/Extended card with 64 K memory)	(\$125/\$295)

Optional Documentation

Apple Ile Owner's Manual	\$20*
Applesoft Reference Manual (two volumes)	\$30
Applesoft Tutorial	\$25
Applesoft package (both books plus disk of software)	\$50
BASIC Programming Manual (Integer BASIC)	\$7
The DOS Manual (DOS 3.3)	\$10* **
DOS Programmer's Manual (available March, 1983)	n/a
DOS User's Manual with Tutorial (March, 1983)	n/a
Apple lle Reference Manual	\$30
Apple lie 80-Column Text Card Manual	\$20*
Apple IIe Extended 80-Column Text Card Supplement	\$15*

^{*} included with associated Apple product, available optionally

^{**} one-page errata sheet available free from dealers



LAST NIGHT WE EXCHANGED LETTERS WITH MOM, THEN HAD A PARTY FOR ELEVEN PEOPLE IN NINE DIFFERENT STATES AND ONLY HAD TO WASH ONE GLASS...

That's CompuServe, The Personal Communications Network For Every Computer Owner

And it doesn't matter what kind of computer you own. You'll use CompuServe's Electronic Mail system (we call it Email^M) to compose, edit and send letters to friends or business associates. The system delivers any number of messages to other users anywhere in North America.

CompuServe's multi-channel CB simulator brings distant friends together and gets new friendships started. You can even use a scrambler if you have a secret you don't want to share. Special interest groups meet regularly to trade information on hardware, software and hobbies from photography to cooking and you can sell, swap and post personal notices on the bulletin board.

There's all this and much more on the CompuServe Information Service. All you need is a computer, a modem,

and CompuServe. CompuServe connects with almost any type or brand of personal computer or terminal and many communicating word processors. To receive an illustrated guide to CompuServe and learn how you can subscribe, contact or call:

CompuServe

Information Service Division, P.O. Box 20212 5000 Arlington Centre Blvd., Columbus, OH 43220

800-848-8990

An H&R Block Company

Circle 93 on inquiry card.



Photo 3: The Apple IIe keyboard. With uppercase and lowercase characters, N-key rollover, auto-repeat on all keys, and special-function keys, it provides a mix of functions found on both typewriter-style and computer keyboards. Unfortunately, the left-arrow key is inconveniently placed for its use as a backspace key while using BASIC. The special Open-Apple and Solid-Apple keys are used to invoke the self-test routines, simulate a power-up cold start, and may be read as paddle push buttons 0 and 1.



Photo 4: The Apple IIe video display. Photo 4a is an example of the 40-column text display showing both uppercase and lowercase characters available. Photo 4b shows the Apple IIe 80-column display. The plus sign within the cursor shows that you are in Escape mode, which provides expanded editing and cursor-control functions.

grams to provide their own autorepeat or special pause functions, overriding the auto-repeat built into the keyboard.

Text-Display Modes

The standard Apple IIe displays 24 rows of 40 characters (see photo 4a). It provides normal (white on black) and inverse-video (black on white) modes for all characters, and a flashing mode for the uppercase characters and special symbols. If you try to display a lowercase character in flashing mode, the display shows a flashing special character instead. Although this may seem strange, it emulates exactly what is displayed by Apple IIs that have been modified with added lowercase adapters, and is done this way for compatibility with those machines. The Apple IIe also provides an alternate character set where there are only two modes—normal and inverse-but the characters are always displayed correctly.

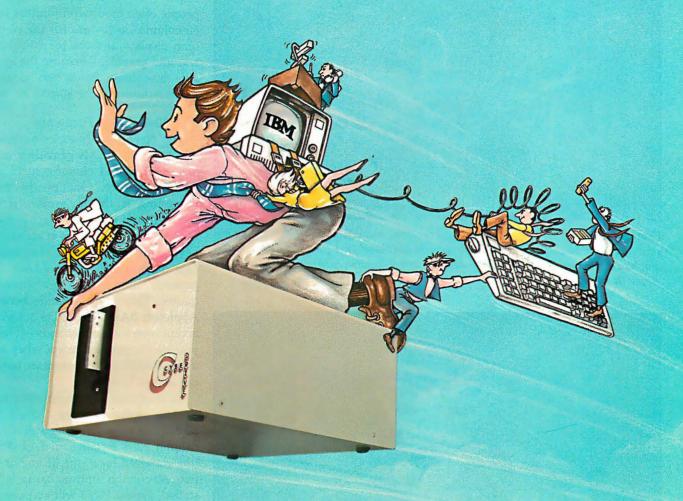
Although the ability to display both uppercase and lowercase characters is a definite improvement, I suspect that few users will stay with the 40-column display. The two 80-column options are just too useful—and too inexpensive—to be ignored.

The 80-Column Display Options

To accommodate users who need a display wider than 40 columns, the Apple IIe offers two 80-column option cards: the 80-column text card and the extended memory 80-column card, which includes 64K bytes of additional memory. Either of these cards can be plugged into the auxiliary connector, and they are both just memory cards. Photo 4b shows an example of the 80-column text display.

The actual 80-column display circuitry and firmware are already built into the Apple IIe. In fact, by setting the appropriate soft switches, you can see an 80-column display on any Apple IIe—every character in the normal 40-column display will be displayed twice. Both of the 80-column cards (see photo 5) provide the additional display memory required for 80-column operation; however, the 80-column text card is inexpensive

Performance Breakthrough...



...the CYBERDRIVE[™] for the IBM Personal Computer

13.5 or 27 million bytes of disk capacity in a single cabinet with an integrated mini-cartridge tape for secure data backup.

Setting an exciting new microcomputer standard, the CYBERDRIVE¹ combines a full package of features.

It offers new, higher performance levels, with an integrated business-oriented backup device.

As the CYBERDRIVE is made available for other systems, media transfer is assured regardless of the host hardware or Operating System.

Operating System.

The CYBERDRIVE slashes the seek time dramatically—e.g. the usual 5 Megabyte stepper-motor Winchester disk offers average seek time typically in the range of 100 to 200 milliseconds (incl. head settling).

With the CYBERDRIVE, the average seek time across more than five times as much data is only 33 milliseconds (incl. head settling).

This basic speed, coupled with disk cache buffering and a peak transfer rate of 1 million bytes per second, make the CYBERDRIVE a performance champ!

The integrated mini-cartridge tapes used for backup of data allow dumping of (for example) 10 million bytes of data in about 10 minutes... much faster than other tape or floppy disk backup techniques. Hardware read-after-write error checking is incorporated in the tape device.

...And don't fail to ask about our superb lineup of serious business software (also offered in CYBERDRIVE format) including:

RM/COBOL² compiler-the micro industry standard.

MBSI³ RM/COBOL general business applications (derived from MCBA⁴ minicomputer packages)...thousands in use...money back guarantee...source program license.

CRT! from Cybernetics (COBOL Reprogramming Tool!)Program generator for RM/COBOL to ease program development and maintenance . . . an alternative to a Data Base System.

CBASIC25 & CBASIC865 compilers ... for aficionados of a useful BASIC.

The software is available on a variety of industry-standard Operating Systems including CP/M⁵-MP/M⁵ (both -80 & -86), OASIS®, PCDOS, and UNIX7. Inquire for specific details and prices.

Trademarks of:

BERNETUCS

Cybernetics, Inc. 2 - Ryan-McFarland Corp. 3 - Micro Business Software Inc.
 Mini-Computer Business Applications. Inc. 5 - Digital Research, Inc. 6 - Phase One Systems, Inc. 7 - Bell Laboratories

8041 NEWMAN AVE., SUITE 208 HUNTINGTON BEACH, CA 92647 714/848-1922

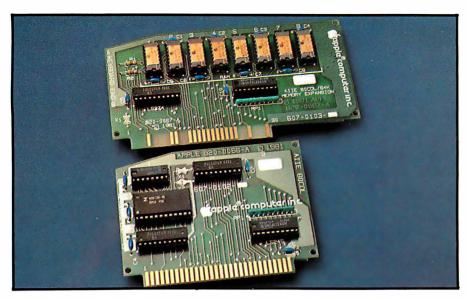


Photo 5: The Apple IIe 80-column text card (bottom) and extended memory 80-column card (top). The 80-column text card provides an additional 1K-byte text/low-resolution graphics display page, while the extended memory 80-column card duplicates the entire Apple IIe 64K-byte address space.



Photo 6: Apple IIe graphics. See the text for a full explanation of the modes available.

because it is simply a 1K-byte memory card.

The extra (separate) display memory is needed because the 80-column circuitry displays twice as many characters in the same period of time as the 40-column circuitry. This doubles the rate at which the display accesses memory; if the Apple's main memory was used, this wouldn't allow the processor any memory cycles. The designers found an ingenious solution to this dilemma. The Apple IIe's dis-

play always accesses memory at the 40-column rate, allowing the processor all the memory cycles needed. When in 80-column mode, however, the display circuitry reads both the main memory and auxiliary display memory simultaneously, saving the character that is read from the auxiliary memory and displaying it after the character read from the main memory. This allows the display to operate twice as fast but doesn't affect the operation of the processor.

One of the nicest things about the Apple IIe 80-column option is that it is compatible with all other Apple IIe display modes. In the old Apple II, people often used two monitors with 80-column cards—one for the 80-column display and one for 40-column text and graphics—because the available 80-column cards had separate video outputs for the 80-column text.

The 80-Column Firmware

The 80-column routines built into the Apple IIe ROMs provide a number of advanced cursor-control and editing features. One of the most interesting is the lowercase restrict mode. If you type a Control-R when the 80-column firmware is active, the keyboard input is restricted to uppercase only (just as if Caps Lock was pressed) unless you are between quotes. This mode is handy because Applesoft BASIC and DOS 3.3 won't accept lowercase commands—it locks you into uppercase except when typing in BASIC string constants (which can accept lowercase).

To maximize its compatibility with existing software, the Apple IIe 80-column firmware emulates an 80column card installed in I/O slot 3 (the standard location). If one of the two 80-column option cards is installed, typing PR#3 will activate the internal 80-column routines and disable any firmware installed in slot 3. Once activated, the 80-column firmware and its extended editing features can be used in either 40-column or 80-column mode. In fact, by setting one of the soft switches, you can use the 80-column firmware even if you don't have the 80-column card installed.

To help you keep track of which display software is active, the Apple IIe displays three different types of cursors. A small checkerboard cursor indicates that the 80-column firmware is inactive. A larger block cursor is displayed when the firmware is on, and a + (plus sign) within the block indicates that the firmware is in "Escape mode" and is waiting for another keystroke, which will be interpreted as a cursor-movement command.

The 80-column software is also

No Waiting For Software.

Nowthatthe Sage II has sparked the 16-bit supermicro revolution, you might wonder when software will become available.

The answer is now, because the Sage It's p-System operating system accommodates vast libraries of programs already produced for8-bit machines.

What'smore, this exciting micro has fired the imagination of programmers who are busy developing new software to take full advantage of its performance capabilities.

No Wait States.

The Sage II is based on the incredible 68000 processor.

One advantage is the total elimination of memory access wait states so that interaction between the processor, RAM and disk drives is speeded up.

If you've been blaming your floppy for tardiness, consider this: The Sage II loads a 20K program in about a second—from its 5¼ " floppy.

The Specs You've Boen Waiting For.

8 Mhz 68000 • up to ½ Mb on board RAM • 24bit bus addresses up to 16 Mb • one or two built-in 5¼" floppy drives—320K to 1.3 Mb • RS-232C ports • Parallel port • IEEE-488 interface • Call or write for full specifications.

No Waiting Until You Can Afford It.

A Sage II with one disk drive and 128K on board RAM is priced at just \$3,600.

It represents more computing power for the money than ever before.



No Waiting For Delivery.

Our assembly, testing, and shipping departments are currently achieving a 4 day turnaround time on incoming orders. Order direct or through your dealer.

A Free P-System For Those Who Don't Wait.

The p-System operating system and Pascal, FORTRAN 77 and BASIC compilers which alone lists for \$1,475, we're now including free with the Sage II.

So see your dealer or give us a call. We'll be waiting to hear from you

ing to hear from you. 35 North Edison Way, Suite 4, Reno, Nevada 89502, (702) 322-6868.



Circle 375 on inquiry card.

16 Bits, No Waiting



compatible with other languages. If you have Apple's Pascal 1.1 or one of the Apple II CP/M systems, these both can load in 80-column mode and operate correctly without any additional patches or modifications.

Graphics

Like the Apple II, the Apple IIe offers two standard graphics modes. The low-resolution mode produces 16-color graphics, with either 40 by 48 pixels (picture elements) or 40 by 40 pixels and four lines of text. The standard high-resolution mode provides a 280 by 192 bit-mapped pixel array with half-dot-shift logic (see photo 6). Depending upon the software used, this mode can be used to provide limited 560 by 192 monochrome graphics, 280 by 192 monochrome graphics with no limitations, 140 by 192 six-color graphics with limitations, or 140 by 192 four-color graphics. (The vertical dimension is reduced to 160 pixels if you want four lines of text at the bottom.)

The 80-column options are the keys

to the new Apple IIe graphics features. With the proper software, the Apple IIe can provide double-density graphics in both low-resolution and high-resolution modes. Either of the 80-column cards will support the double-density low-resolution graphics, but you will need the extended memory 80-column card if you want to use the double-density high-resolution mode, which can also provide 140 by 192 graphics with 16 colors! At the time this article was written (November 1982), no software was available to support these new graphics modes; however, it will undoubtedly be available soon, either from commercial vendors or user's groups.

The double-density graphics modes are provided by the 80-column display circuitry. Instead of simply displaying bytes sequentially from the main memory, it displays bytes alternately from the main memory and the auxiliary memory, at twice the normal rate. Although this capability was designed to provide an 80-col-

umn text display, the designers soon realized that it could also be used to provide additional graphics modes.

Use of the double-density graphics has three requirements. First, you need a Revision "B" main circuit board: this will probably be the only type shipped after the first month of production. Second, you must connect two pins on your 80-column card; this is explained in the Apple Ile Reference Manual. Third, you must turn on the AN3 output to the gamepaddle connector: this can be used to switch between normal and doubledensity mode. (Unfortunately, the Apple IIe sent to BYTE for review had a Revision "A" main board. Thus, there is no photo of the new graphics modes included with this article.)

Inside the Box

The most significant differences between the Apple II and the Apple IIe are internal. The main printed-circuit board has been totally redesigned and incorporates many new features and options unavailable in the Apple II.

It's not Magic, it's NEC.

NEC distributors pull miracles out of a thimble.

NEC Spinwriters." Their supernatural reliability and versatility have made them the world's most popular letter-quality printers. Here are some of the miracles they can perform for you.

The Spinwriters' rapidly growing catalog of print thimbles give you incredible versatility. One NEC thimble can print in 35 different languages. Another has complete technical and mathematical symbols. Another a full scientific symbol font. The thimbles snap in and out in seconds. And they each last for more than 30 million impressions.

Of all printer companies, only NEC designs and manufactures its own comprehensive family of forms handlers. We've got eight of them, enough to handle any form you can conjure up. They're all user-changeable, too.

Spinwriters have remarkable reliability, more than two years between failures in normal usage. And they need no preventive maintenance or



routine lubrication. Ever. With only 3 major spares, mean time to repair is only 15 minutes.

The NEC Spinwriters. Reliable, quiet, compact, flexible and easy to use. For more information on NEC Spinwriters, or to find out how to become an NEC distributor yourself, contact the authorized NEC distributor nearest you.

Spinwriter is a trademark of Nippon Electric Co., Ltd.

NEC Information Systems, Inc.

The power supply is unchanged, but there are now seven I/O expansion slots instead of the eight found in the Apple II. Part of the Apple IIe memory emulates a 16K-byte RAM (random-access read/write memory) card (commonly installed in Apple IIs), and the card's former location, I/O slot 0, is no longer present.

The most obvious change is a reduction in the number of ICs (integrated circuits). Where an Apple II with a keyboard enhancer, a 16K-byte memory card, and an 80-column card included about 120 ICs, the Apple IIe provides the same features with just 31 ICs. A large part of this reduction is due to the use of 64K-bit dynamic memories, rather than 16K-bit ones. The entire 64K-byte memory of the Apple IIe occupies just 8 ICs.

Another significant reduction in IC count is provided by two custom-designed MOS (metal-oxide semiconductor) ICs—the IOU (input/output unit) and MMU (memory-management unit)—that manage memory

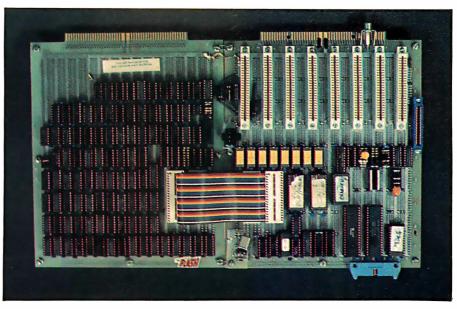


Photo 7: The Apple IIe engineering prototype wire-wrap boards. The custom MOS IOU and MMU ICs are emulated with discrete logic on the board to the left, while the Apple IIe main board prototype is on the right.

and I/O decoding and provide many of the new internal features. Photo 7 shows the engineering breadboard of the Apple IIe main board and a second board that emulates the IOU and

MMU with standard 7400-series ICs, so that the designs could be completely tested before committing them to silicon. The IOU and MMU emulations required about 50 and 60 ICs





Photo 8: The Apple IIe main circuit board. The 31 ICs on this board replace the 120 ICs found in a standard Apple II, including a memory card, 80-column card, and keyboard enhancer, as well as providing a number of new features not available in the Apple II.

respectively. In the final board (shown in photo 8), these 110 ICs are replaced with just two components.

Working together, the IOU and MMU generate all memory-address-

ing and I/O-decoding signals. The MMU is primarily responsible for supporting the 6502 processor. It accepts addresses from the processor, does any necessary memory-bank

switching, and converts the address to the multiplexed form required by the dynamic memories. The IOU provides similar functions for the video display. It also includes the videotiming logic, keyboard control, and other miscellaneous functions. To support foreign versions of the Apple IIe, the IOU includes video circuitry to provide both the Americanstandard NTSC (National Television System Committee) signals and European-standard PAL signals. The IOU ICs are customized during assembly by the manufacturer by connecting the internal bonding wires to the appropriate set of pads on the IC chip inside the package.

The Auxiliary Connector

Although I/O slot 0 is no longer present, a new "auxiliary connector" can be used in a variety of ways. In the factory, the auxiliary connector is used to connect special test equipment to the Apple IIe. With this equipment and the signals available at the auxiliary connector, problems



can be localized to one or two ICs.

Once in the customer's hands, the auxiliary connector is used to hold various video and memory options. Its set of signals provides access to a number of areas in the Apple IIe and can, in fact, be used to totally disable the internal video-generation circuitry, so that an alternate video generator can be installed. Currently, the only options supplied by Apple Computer Inc. for the auxiliary slot are the two 80-column cards. However, other devices should soon be available from Apple and other manufacturers.

The Extended Memory 80-Column Card

Besides an 80-column display, the extended memory 80-column card provides an additional 64K bytes of memory. Rather than switching blocks of auxiliary memory into a fixed address range, the designers chose to replicate the entire 64K-byte addressing space on the auxiliary card and provide a series of soft switches that enable either the main

memory or auxiliary memory in various address ranges. The documentation points out that "even though an Apple IIe with an extended memory 80-column card has a total of 128K bytes of programmable memory in it, it is not appropriate to call it a 128K-byte system. Rather, there are 64K bytes of auxiliary memory that can be swapped for main memory under program control."

To help programmers use the auxiliary memory, the Apple IIe 80-column firmware provides two special routines: AUXMOVE and XFER. Using these two routines, you can store and retrieve data in the auxiliary memory or transfer control to a program that resides there.

AUXMOVE is used to copy data from main memory to auxiliary memory or vice versa. You simply store the data's starting address, ending address, and destination address in memory locations; set or clear the processor's carry flag to indicate direction; and call AUXMOVE. XFER is used in a similar fashion in order to

jump from programs in main memory to others in auxiliary memory (or vice versa). XFER may also be used to switch stacks and zero pages as you transfer from one section of memory to the other.

These two routines, and the auxiliary memory, open up some interesting possibilities. It appears to be possible, for example, to have an entire Pascal system residing in main memory, while a DOS 3.3/BASIC system is in auxiliary memory, and be able to transfer control between the two systems at will.

Soft Switches

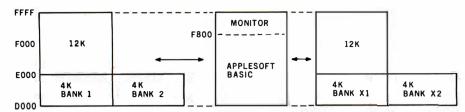
To support the auxiliary memory and 80-column display software, the Apple IIe provides a number of new soft switches and adds a few new features to the old ones. (A soft switch, in an Apple II or Apple IIe, is a memory location that can be accessed to cause some hardware change to take place.)

Existing soft switches in the Apple II were used to select various video



RAM CARD AREA

HEXADECIMAL ADDRESS



ROMS

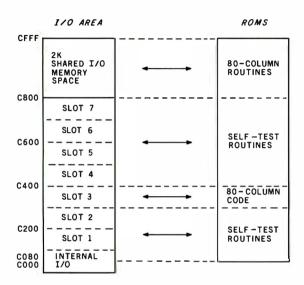


Figure 1: Apple IIe memory maps. Within the Apple IIe's main memory, ROM can be switched to replace RAM in various address ranges. When the extended 80-column text card is used, it adds 64K bytes of switched memory. Areas of RAM and ROM that can be switched are indicated with arrows. In the 80-column text and double-wide graphics modes, the computer's main memory and the auxiliary memory on the card are accessed simultaneously to double the display density. Figure 1a (above) shows the language-card RAM and I/O areas, while figure 1b (on page 82) shows the main RAM and display areas of memory. The 80-column text card includes the alternate text page x1 only.

modes and control the internal I/O devices (keyboard, game paddles, speaker port, and cassette port). If a 16K-byte memory card was added, it included additional switches to disable the card or to enable areas on the card as read-only or read-write memory. When using the switches, however, the programmer had to keep track of them. There was no way to read them back.

The Apple IIe makes many of the existing soft switches, and all the new ones, readable. Specifically, you can read back the states of the videomode switches, the 16K-byte memory-card-area switches, and all the new auxiliary-memory switches by examining locations between hexa-

decimal C010 and C01F. To help provide better graphics animation, you can also read the "vertical blanking" from the video display, thus allowing you to change the contents of memory while it is not being used to create the video display.

The auxiliary memory is supported by several new switches that change the display from main to auxiliary memory, enable display areas in both memories at once for 80-column text or double-density graphics, and control reads and writes to the auxiliary memory. Other switches allow you to overlay portions of the I/O-slot memory space with the internal ROM 80-column firmware or self-test routines, and select either the standard or

alternate display character sets. (Figures 1a and 1b provide memory-switching maps for the Apple IIe.)

Apple II Compatibility

One of the major concerns during the design of the Apple IIe was its level of compatibility with the Apple II. Literally thousands of programs are written for the Apple II, and numerous hardware products are designed to plug into Apple II I/O slots. User surveys had shown that the volume of available software was a prime consideration among purchasers. It was therefore obvious that the new machine had to be compatible with virtually all existing Apple II hardware and software products, while still including the desired new features and design improvements.

The designers succeeded admirably. The Apple IIe is physically a complete redesign; logically, however, it is compatible with almost all existing Apple II software and hardware add-ons. This goal was not met simply—more than 150 software products and numerous peripheral devices were tested for compatibility during the Apple IIe development process.

Unfortunately, a few Apple II-based products from other manufacturers won't work properly in an Apple IIe—primarily because their designers did not follow Apple's interface guidelines. In general, accessory cards that occupy one of the I/O slots and do not connect directly to an IC socket will operate correctly. Others that connect directly to the main circuit board or to the keyboard will not be compatible without redesign.

Examples of cards that will work in an Apple IIe include 80-column cards, serial and parallel interfaces, graphics tablets, disk controllers, and memory cards that do not connect to an IC socket. To maximize compatibility, Apple II-style video- and game-paddle connectors are provided inside the case, even though the new-style connectors are now on the back panel. This allows existing video switches, joysticks, and game controls to be used with the Apple IIe (although they may cause excessive

Beyond DBMS Eventually microcomputers will all use programmer-less information management systems like INFORMA X^a. The next generation

Your microcomputer, no matter how expensive or well designed, is no better than the program it uses. And most programs are limited to only one or two functions. They are for accounting, or payroll, or inventory, or mailing, or filing, or computing, or whatever... and usually for just one user, as well.

in software. The first in multi-user.

Soon after buying a first computer every businessman or professional finds he needs to do more than one procedure with it. He also discovers that more than one person in his office will need to use it at the same time.

INFORMA X is the first information management system professionally engineered from its inception to operate in the multi-user, multi-tasking, and multi-processing environment. It is the only database software you will ever need.

The unique achievement of INFORMA X is an information system which structures data for storage and retrieval. It is the most efficient framework for an elegant computer filing system. Usually these systems require a programmer to fit them to the particular tasks of your business. INFORMA X provides a programmer-less system for even the first time user to create programs which fit exactly his own business needs.

Menu driven, screen oriented

tutorial response techniques allow anyone to create, modify or customize programs to their own exact requirements. No "computereze" or cryptic languages are used; only single keystroke command structure has been used through the system's five components: THE DATABASE, THE REPORTER, THE APPLICATION WRITER, THE SECURITY SYSTEM and THE MENU MAKER. Automate your information storage, retrieval and transmittal... your way... and step into the next generation of business life.

ABACUS DATA is committed to creating software to enhance your business today and tomorrow. We welcome questions and comments. Use our toll free service numbers. 1-800-874-8555 and in Florida call collect 904-398-8547.



abacus data, inc.™ 1920 San Marco Boulevard Jacksonville, Florida 32207

CURRENT SPECIFICATIONS: Z80, 8085, 8080A
Minimum Memory 52K. CP/M®, MP/M®, MmmOST®, TurboDOS®
Operating Systems. Current delivery customized for TeleVideo®,
Osborne®, Molecular®, Action®, and Altos®
(Call for others)

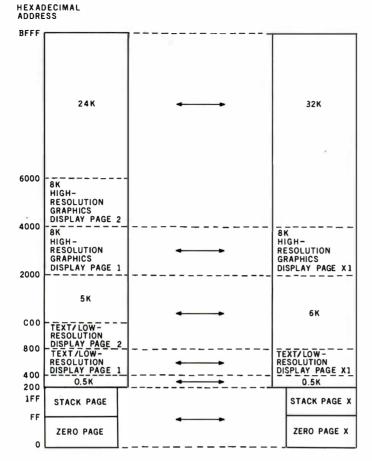


Figure 1: (continued)

RF interference).

Devices that won't work in an Apple IIe include keyboard enhancers, lowercase display adapters, numeric pads (existing designs), and memory cards that connect to an IC socket with a small flat cable. Fortunately, the capabilities of most of these devices are already included in the Apple IIe.

It is much harder to quantify which Apple II software products will or will not work in an Apple IIe. To support the new hardware features, certain changes had to be made to the ROM monitor routines, and these changes may affect programs that use the monitor. Approximately 40 standard entry points and routines in the monitor have been documented by Apple Computer, and all these have been left intact and operate correctly, even though the actual code may have changed somewhat. However, some programs use undocumented entry points and these may or may not run properly.

It seems safe to assume that all programs written in higher-level languages will work. Thus, software written in Integer or Applesoft BASIC, FORTRAN, PILOT, Logo, and Pascal should run correctly (providing that no strange monitor CALLs were made), along with CP/M programs that use the standard BIOS (basic input/output system) CALLs. Also, any software sold by Apple Computer will be compatible with the Apple IIe. In addition, a great deal of commercial software has been tested at Apple Computer, and vour local dealer should know which products are compatible with the new machine. (If in doubt, you should ask the dealer to demonstrate the program on an Apple IIe before purchase.)

Software

As with most new computers, a great deal of software isn't available yet specifically for the Apple IIe, but the machine doesn't require it. Most

of its new features can be applied to make existing Apple II software easier to use. At least initially, the Apple IIe will use the same DOS 3.3 disk operating system that is currently used in the Apple II, although it will probably be repackaged on a new master disk

Apple Computer Inc. has done a great deal to make writing programs for the Apple IIe as easy as possible. The Apple IIe Reference Manual provides precise technical descriptions of every area of the machine, and the built-in memory-management routines will encourage programmers to take advantage of the extended memory option. Because the 80-column firmware acts like a conventional 80-column card in I/O slot 3, programs that use 80-column displays can easily be compatible with both the Apple IIe and the Apple II.

To help programmers identify the type of machine and which options are present, the Apple IIe Extended 80-Column Text Card Supplement to the reference manual provides an identification routine, with examples in assembly language, BASIC, and Pascal. To aid outside developers (Apple considers them extremely valuable), 120 Apple IIes were lent to various vendors during the eight months prior to the product introduction. This allowed a large number of software and hardware suppliers to prepare a variety of new products-eighteen programs from ten companies are scheduled for introduction coincidentally with the Apple IIe.

One interesting new program for the Apple IIe is simply called "Apple presents Apple IIe." Primarily a keyboard tutorial, it uses humorous text and excellent graphics to guide you in a friendly fashion through the features of the Apple IIe keyboard. The section that teaches the cursor keys includes two simple but well-designed maze games where you guide a rabbit or gnome through a maze with the cursor-control keys. These made an immediate hit with our 3-year-old, who within 15 minutes was guiding the rabbit through the maze and laughing at its antics when it hit the walls.



Applewriter and Quickfile

Applewriter IIe and Quickfile IIe are Apple Computer's first two major software products that are designed to use all the new Apple IIe features. Both are enhanced versions of the same programs for the Apple III, and both are characterized by being extremely friendly to the user-they provide clear, simple prompts, multiple menus to select options, and numerous "help" screens to guide you through the program operations. Although at the time this article was written (with Applewriter) the documentation was preliminary, it appears to follow the format of the other Apple IIe manuals—clear and friendly.

Applewriter IIe is a documentoriented word processor with numerous editing and print-formatting features. It will run with or without the 80-column display and extended memory options, but will use them if they're present. One of the more interesting features of Applewriter IIe is called WPL (word-processing language). WPL allows you to compose and execute a series of Applewriter commands that are stored in a disk file. It provides looping, conditional execution, and subroutine calls, effectively allowing you to automate the production of form letters, invoices, or other repetitive tasks. WPL also provides a turnkey capability that can be used to automatically execute a WPL program after you load the Applewriter IIe disk.

To get familiar with Applewriter Ile, I used it to prepare this article. I was particularly impressed with the print-formatting capabilities. It was very easy to set up a standard manuscript page—double-spaced, one-inch margins, with headers and footers—and I could preview the actual appearance of the result by printing to the display rather than the printer. It did, however, take me a while to get used to some of the editing features. When you delete characters, words, or paragraphs, Applewriter deletes from right to left. This is fine if you

are correcting a mistyped character immediately but seems a little awkward otherwise. On the whole, I liked Applewriter and recommend that you look it over if you are considering purchasing a word processor for your Apple IIe.

Quickfile IIe is an informationfiling system (or database manager) that allows you to store and retrieve information, search and sort your files, and print reports in formats that you define. It also has math capability—you could set it up, for example, to file a list of checks and their amounts, and it could also balance your checkbook for you.

Quickfile IIe is also compatible with Applewriter IIe. Quickfile reports can be included in Applewriter documents, and Quickfile files can guide the production of Applewriter form letters. I didn't get a chance to spend much time with Quickfile, but it appears to be very well done, as is most of Apple's software.

Documentation

The new Apple IIe manuals are so good they must be seen to be believed. In a spiral-bound format, slightly larger than the Apple II manuals, they are extremely clear and readable—presenting their information in an easy step-by-step manner. It is obvious that Apple spared no effort or expense when designing them.

The Apple IIe Owner's Manual is an excellent example of the right way to introduce a beginner to a first computer. Using clearly written text and numerous color photos, it starts out by telling you how to unpack and set up the computer and then explains the various parts of the system in layman's terms. As you read through the manual, points of special interest and warnings are clearly noted and possible error messages are explained. Nine pages are devoted to the keyboard alone—they describe how to use each of the functions available and how they are commonly used in programs. Further chapters introduce you to the system hardware, the DOS 3.3 disk operating system, the display features, and various computer applications. Other chapters describe

WICAT 68000 computers with integral database

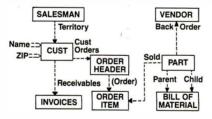
Concurrent's integral' database boasts features usually found only on "mainframes".

- quick design through graphic techniques
- structures that model real world complexities (see example at right)
 large capacity and expandability
- rapid access of all related records
- automatically maintained structure
- efficient use of disk space
- easy to learn and use

MenuSystem™

MenuSystem's screen definition capability provides the environment to build "user friendly" systems easily. Screens are "painted" on the terminal and are ready to use with no programming.

Application systems are developed quickly using Concurrent's software on the powerful WICAT computers. For more information, please write or call (513) 281-1270



integral[™] database and MenuSystem \$2,000

- (substantial discount when ordered with computer)
- (integral[™] and MenuSystem are trademarks of Concurrent Corporation)

WICAT System 150

- Motorola 68000, 256K memory, 10MB Winchester
- 760KB floppy, terminal, system software, language

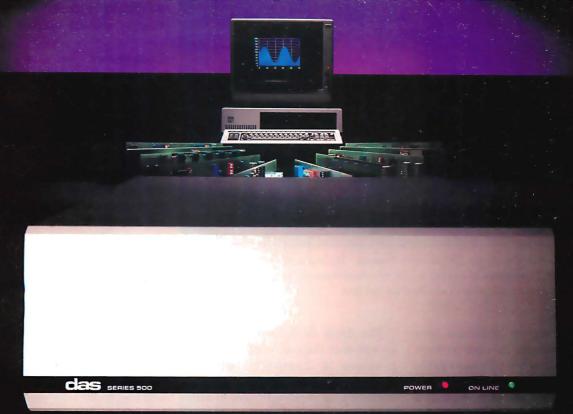


[™]Concurrent™

1870 Madison Road Cincinnati, Ohio 45206

HIGH TECHNOLOGY MICROCOMPUTERS FOR SCIENCE AND INDUSTRY

THE NEW DAS SERIES 500 FOR THE IBM PC:



THE DATA ACQUISITION & CONTROL SYSTEM YOU SHOULD CONSIDER OVER A MINI. EVEN IF MONEY IS NO OBJECT.

Let's say you have enough money to buy nearly any data acquisition and control system you might want. What will you choose?

If sheer power is your main requirement, you might choose an expensive minicomputer system. But, then again, you might just as well choose the new DAS Series 500.

Simply plug the Series 500 into any off-the-shelf IBM Personal Computer and you'll have up to 336 channels of analog input, 60 channels of analog output and 192 channels of digital I/O (even AC/DC device control). And with measurement speeds as high as 25,000 analog data points per second, and true 12 or 14 bit precision, you'll have enough power and accuracy for the most demanding applications.

If you need flexibility, you'll want to compare other, more costly systems to the fully modular Series 500. It comes supported by an extensive library of integrated plug-in modules that let you custom tailor almost any combination of inputs and outputs, digital or analog. And do so almost instantly.

So the Series 500 is ideal for hundreds of applications in product test, process control and energy management; in psychology, biology, analytical chemistry and neuroscience.

If ease of use is high on your list, consider this: Only the Series 500 comes equipped with the advanced, integrated Soft500 software package. With it, you can set up, collect, store, control, display and analyze, all with a few simple BASIC commands.

In fact, Soft500 makes programming so easy, you can be up and running with your Series 500 the same day you get it. Even if you're not a computer expert.

Now compare advanced features. Like exclusive foreground/ background software architecture that lets you analyze data while you collect it. Like the real-time clock/ calendar and precision interval timer. Or the tremendous range of signal conditioning options, including software selected gain and offset, amplification from millivolt levels, and provision for direct connection of thermocouples, strain gauges and RTDs.

These are features you might not get elsewhere, no matter how much money you spend. But then, why spend all that money?

Because for less than \$6000 you get both the advanced capabilities of the DAS Series 500, plus an IBM PC* (which incidentally, you can still use to do all the other things a PC does so well).

For complete information on the DAS Series 500 data acquisition and control system, write to us at Data Acquisition Systems, Inc., 349 Congress Street, Boston, Massachusetts 02210. Or call us at

617 423-7691.

das

M.P.C. purchased separately. Also available for the Apple II.
M.P.C.A. Anule II are registered trademarks.



Photo 9: A look at the Apple Ile Owner's Manual. The manuals provided with the Apple Ile set new standards of quality by being comprehensive, very friendly, and by containing numerous color photos to illustrate the text.

the various computer languages, how to add components to your system, and what to do when you have problems

This is clearly the first manual a new owner should read, and is also the only manual that is included with the Apple IIe. The new owner picks up the only manual in the box and it tells exactly what to do to get the system up and running. To avoid confusion, all other manuals are optional, and many manuals included with products are available separately. (The Apple Ile Owner's Manual is shown in photo 9.)

The Apple IIe Reference Manual is an optional manual worth noting. It provides a complete technical description of the machine, and its operation, in detail sufficient to satisfy almost anyone. It provides descriptions of the hardware and special features, instructions for using the monitor, timing diagrams and pinouts of the custom ICs and ROMs, and a complete set of schematics. No self-respecting programmer or experimenter should be without this manual. Apple also provides other manuals, including rewritten Applesoft and DOS manuals and reference manuals for the Apple IIe and the 80-column boards; see the "At a Glance" text box on page 70.

Conclusions

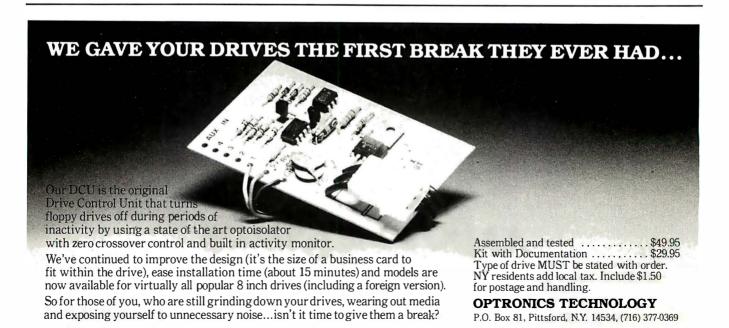
As you can probably tell, I was impressed with the Apple IIe. The people at Apple Computer had their act together when they designed this machine and it really shows.

I am disappointed that the 80-column cards are not as inexpensive as they were rumored to be; other vendors will probably design less expensive ones. However, with the new keyboard and 80-column display, the Apple IIe can handle just about any task.

The manuals with the system are superb. They are friendly, easy to read, and comprehensive, setting a new standard for the industry to meet

Applewriter IIe and Quickfile IIe are well-written, useful programs that will find favor with people who wish to use their Apple IIe for word processing and information filing. With these two programs and a spreadsheet (like Visicalc), you could satisfy virtually all your computing needs.

I was most impressed with the balance struck between compatibility and new features, and the obvious care that went into the design. Congratulations, Apple Computer, you've produced another winner.



15 new problem-solving Microboard products.

Now, RCA offers more than 85 "real world" solutions.

The broadest line of CMOS Microboard products in the industry continues to expand. This means more capability for you.

For example, our Microboard Floppy Disk Controller enables you to interface with up to four industry standard 8-inch, 5¼-inch mini, or 3½-inch micro floppy disks. You can program the track stepping rate, head load time and head unload time.

This controller is especially effective with our new Micro Floppy Disk Drive

Module, which contains two 3½-inch disks—each capable of holding 322K bytes of formatted data. And the module mounts directly into our industrial chassis

We're also introducing four new Microboard power supplies to increase your design options in the U.S. and Europe.

And, if data communications is important to you, our Bell compatible MODEMs are joined by two new CCITT compatible Auto MODEM Microboards for Europeto-Europe communications.

We've even improved internal system communications for software development with our powerful new MicroDOS Disk Operating System and Monitor Program on ROM.

And, we've added four new highspeed static CMOS memory boards and an interface board. Our 32K/64K-byte RAM/ROM, 8K-byte RAM, 16K-byte RAM and 32K-byte RAM boards are attractively priced. The Optically Isolated DC Interface board features 8 input and 8 output parallel I/O lines.

Now it makes more sense than ever to choose RCA CMOS Microboards: the proven, economical, real world problem solvers.

To find out the full story behind these new products and the more than 70 other members of our Microboard family, contact any RCA Solid State sales office, representative or appointed distributor.

Or call (800) 526-3862.

All prices shown are 100* optional distributor resale in U.S., except those marked * which are single unit prices.

RCA Solid State headquarters: Somerville, NJ. Brussels. Paris. London. Sao Paulo. Hong Kong.

Circle 367 on inquiry card.



Now our \$29.95 complete Pascal for CP/M is an even better bargain:

annound new January Pascal Pascal

WHAT THEY SAID ABOUT JRT PASCAL 2.0:

CREATIVE COMPUTING, Nov. '82 "...While 'there is no such thing as a free lunch,' JRT Pascal at \$29.95 (which includes postage) certainly allows the user to experience champagne and caviar at cafeteria prices..."

INTERFACE AGE, Oct. '82 "...JRT Pascal is following the example set by Software Toolworks (Sherman Oaks, CA) of offering quality software at extremely low price..."

INFOWORLD, Aug. 16, '82 The magazine's 'Software Report Card' rated JRT's documentation 'good' and performance, ease of use and error handling 'excellent'+ the highest rating.

AND NOW: JRT PASCAL 3.0-

with all the features that earned 2.0 so much praise—PLUS the many new features shown here. The price?—still just \$29.95! This astonishing price includes the complete JRT Pascal system on diskettes and the new expanded user manual. Not a subset, it's a complete Pascal for CP/M.*

Modern computer languages recognize the advantages of dividing programs into easy-to-use functional modules. JRT's external procedure modules give you flexibility to run programs of almost unlimited sizes. Because the procedures are separately compiled, if one part of a program changes only that part needs recompiling. And libraries of external procedures can be built-up containing code and data common to many main programs; the time and duplication savings are obvious.

Faster and more reliable than ever, for beginner or expert, engineer or businessman, JRT Pascal 3.0 provides a set of features unequaled by any other Pascal... or any other language.

OUR NO-RISK OFFER:

When you receive JRT Pascal 3.0, look it over, check it out, compare it with similar systems costing ten times as much. If you're not completely satisfied, return it—with the sealed diskettes unopened—within 30 days, and your money will be refunded in full. That's right: satisfaction guaranteed or your money back!

A JRT bonus: if you want to copy the diskettes or manual—so long as it's not for resale—that's o.k. with us. Pass it on to your friends. But don't delay. Send the coupon or phone today and start enjoying the Pascal advantage; at \$29.95, there's no reason to wait!

NEW Full support for indexed files

NEW CRT screen formatting and full cursor control

NEW Facilities for formatting printed reports

175-page user manual with protective 3-ring binder and 5-1/4" or 8" diskettes

NEW Handy JRT Pascal reference card

NEW File variables and GET/PUT

NEW Dynamic arrays

NEW SEARCH procedure for fast table look-up

Extended CASE statement

Graphing procedures

Statistic procedures

14 digit BCD FLOATING POINT arithmetic

True dynamic storage

Advanced assembly interface

Fast one-step compiler; no link needed

Efficient compiler needs only 85K diskette space

Maximum program size: more than 200,000 lines

More than 200 verbal error messages

Separate compilation of auto-loading external procedures

No limits on procedure size, nesting or recursion

TO JRT CUSTOMERS: THANK YOU.

Your response to very low-priced/high-quality JRT Software has been overwhelming. Since last summer we've added almost 25,000 new JRT owners; because we allow them to make copies for friends, the total number of new users must be enormous! And just as rewarding for us are the many positive comments JRT gets from pleased customers and the media. Pascal 3.0 is an example of

new improvements and products we have in work. It's also another example of our standing policy: best software

quality and best price. So to customers past and future, enjoy and thank you.



JAMES R. TYSON Owner JRT Systems

...new, improved, but...

January Only 1995

histogram

Random files
to 8 megabytes with
variable length records
64K dynamic strings
Activity analyzer
prints program use

ST/PASCAL30

Send to JRT SYSTEMS 550 Irving Street/A1 San Francisco, CA 94122

phone **415/566-5100**

Here's my \$29.95; please send me JRT Pascal. I understand that if I'm not completely satisfied, I can return it within 30 days—with the sealed

diskettes unopened—for a full refund. (Allow 2-3 weeks for shipping.)

I need the 5-1/4" diskettes for □ Apple CP/M; □ Heath, Hard Sector; □ Heath, Soft Sector; □ Northstar; □ Osborne; □ Superbrain;

☐ Televideo; ☐ Xerox 820. I need ☐ 8" SSSD diskettes.

Name		
Address		
City	State Zip	
☐ Check ☐ C.O.D. (CA residents add sales tax. Add \$		
Card #	Exp	

Signature ______ A 56K CP/M system is required.

Circle 222 on inquiry card.

BYTE Interview

An Interview with Wayne Rosing, Bruce Daniels, and Larry Tesler

A behind-the-scenes look at the development of Apple's Lisa.

Chris Morgan Gregg Williams, Senior Editor Phil Lemmons, West Coast Editor

Of the more than 90 members of the Apple engineering staff who participated in the Lisa project, Wayne Rosing, Bruce Daniels, and Larry Tesler are three of those who were most responsible for its final form. Rosing, formerly of the Digital Equipment Company, oversaw hardware development until Lisa went into pilot manufacture and then assumed responsibility for technical management of the entire Lisa project. Daniels and Tesler were responsible for Lisa's systems software and applications software, respectively. Chris Morgan, senior editor Gregg Williams, and West Coast editor Phil Lemmons interviewed the three at Apple's headquarters in Cupertino, California, last October.

BYTE: Tell us how you staffed the Lisa project.

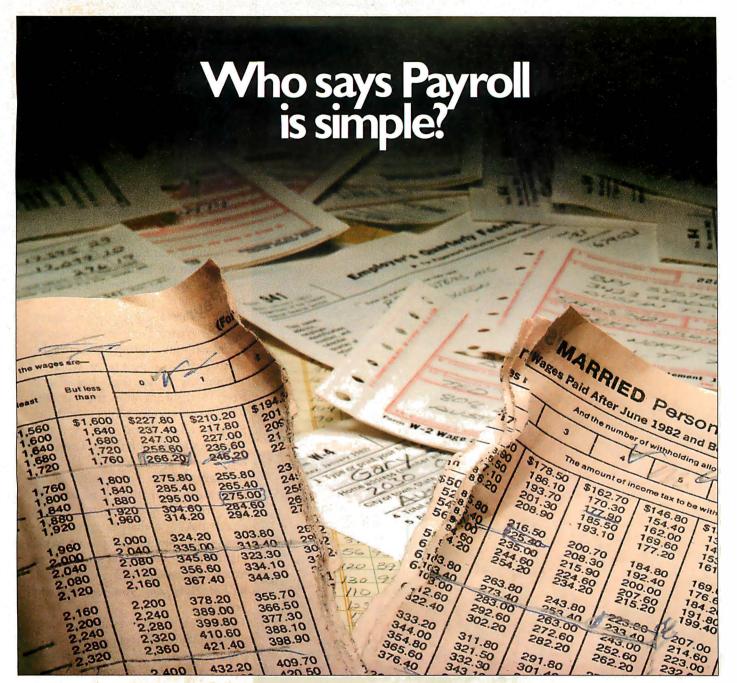
Tesler: In software, we drew mostly experienced people from other companies and very few people straight out of school. Even the ones we took out of school generally had lots of job experience. In fact, one time I surveyed the applications group and found an average of nine years' work experience in software. When we looked at résumés, we tried to find people with several years of experience in development. We made exceptions if someone had specialized in something we were interested in or was a top student who also had good summer experience. We wanted an experienced team because what we've been doing is a very major software effort. It's very complex, and there's such a large body of software to crank out and make reliable that it takes experienced people.

BYTE: When did you do the hiring? Tesler: The project went through phases. There was some design and some implementation when the project first started two and a half years ago, but we hired most of our software people about two years ago. In three months, we hired most of the software staff, and then they spent several months learning about the

machine and designing their particular parts of the software. The bulk of the programming started about a year and a half ago.

We had to spend quite a long time just building a team - people who had a common view and could work together. We drew people from different companies with completely different backgrounds and tried to do something that nobody in this group had ever done. Some of us had done parts of it before. We were developing everything in parallel: the hardware, the operating system, the applications, the manuals, the details of the user interface. We did have a sort of fundamental philosophy, but having to do everything at once means you're never sure when you're going to get what you need from the person who does whatever you need next. Daniels: I think communication is the

key there. If you have that many things going in parallel, you spend a lot of time communicating so each of you knows what the other's doing and can depend on each other.



There is simply no other Payroll Accounting system this complete available for microcomputers. The BPI Payroll System performs all the standard payroll functions. It contains tax tables for FICA, federal and all 50 states plus Puerto Rico and the District of Columbia, as well as cities and counties with uniform methods of taxation. And our Update Service keeps your Payroll System current with all tax law changes affecting you.

Companies with as few as four or as many as several hundred employees in different states or branch offices can simplify their payroll accounting dramatically with the BPI Payroll System. It provides for expense reimbursement, automatic calculation of net pay, and wage distribution. It also produces W-2's, payroll checks and other important payroll reports.

With the BPI Payroll System, employees may be paid weekly, biweekly, semimonthly

or monthly by three methods: salary, hourly with up to three different hourly rates, and commission. The system also provides for income from tips.

Deductions from FICA, federal and state taxes are built in, and you can easily set up as many as six other deductions for your employees.

All BPI Systems software is designed to match the growth of your company:

- General Ledger
- Accounts Receivable
- Accounts Payable
- Inventory Control
- · Job Cost
- Time Accounting

The Payroll System interfaces with the General Ledger and Job Cost Systems as well.

Payroll Accounting is simple if your software is powerful enough. Ask for a demonstration by your computer dealer or write us for more information. You'll see how simple Payroll Accounting can be.



SYSTEMS*

SIMPLY, THE MOST POWERFUL SOFTWARE IN BUSINESS.

3423GUADALUPE / AUSTIN, TX 78705 / 512-454-2801
BPI and BPI Systems are trademarks of BPI Systems Inc.





BYTE Interview

Tesler: It took a while to work out those channels. It was rough at the beginning, but it's pretty easy now. Our progress was gradual. I think I'd call it team-building. Some of the things were hard to do in an organization that's thrown together like this. But once you've got a team built, it's a valuable asset. Of course, we were doing technical work all along, but in a sense we spent a year building the team and a year building the product. Now when we build something else, we can do it without the teambuilding step.

BYTE: What about project security? Rosing: We tried to be as secure as we could without creating a discouraging atmosphere for people to work in. Within the group there has always been total information transfer, and we've kept lots of machines available. People have been able to take machines home with them. There was always the risk of losing a Lisa in a burglary, but we had a rule that the floppy disk had to be kept separate from the machine. We felt it was worth risking a theft to gain the increased productivity of people working at home. We've been very fortunate: we haven't lost one machine. BYTE: How did you schedule the project?

Tesler: People made estimates, but it was difficult. All the estimates were conditional—"If the hardware is here by a certain date and the operating system is frozen and I have the user-interface definition and I can get some assistance from people who have the right sort of experience, then I can do it in this many months." But none of the ifs were ever really possible. People were really hesitant to make a firm date because there were so many contingencies. We did come up with schedules all the time, but they were myths.

Daniels: Getting Lisa to market has been a dream, a goal that we all have. Although we're willing to make compromises to get Lisa out expeditiously, the dream of what we're trying to achieve is the major thing.

Rosing: We had this dream of what we wanted to do, and I think over

Excellence Acknowledged.



Some people demand the best.

Superior quality at superior value is the key to those few items that rise above the crowd to shine as unique symbols of perfection. We call these the "best" products, and the best in Apple II®-compatible drives is the Micro-Sci line of 5 ¼" floppy disk drives and subsystems.

Business, commercial and professional people needing more storage, greater reliability and faster access than previously available have been impressed with Micro-Sci's A4O system since we introduced it back in 1979. For a lower list price than the Apple Disk II®'s, the A4O offers 20Kb more capacity, faster access time and greater data reliability.

The ideal solution to the Pascal* and CP/M+ user's problem of space limitation is a Micro-Sci A70 drive, combining quick access and high reliability with a full 286Kb storage capability.

The newest member of Micro-Sci's Apple Il-compatible family is the A2, the perfect alternative drive for entertainment and other

packaged software. A direct replacement for the Disk II, our A2 features total compatibility at a lower cost total. And you can mix, or match, our A2 drive and controller with their drive and controller and vice versa. You have complete freedom of interchangeability.

Micro-Sci even goes one step further with its controllers to include operating features the competition lacks, like jumperselectable 3.2 and 3.3 DOS.

Give yourself the privilege.

You deserve more for your money, and Micro-Sci delivers the most in quality, reliability and performance.

So when you consider additional drives or a disk subsystem for your Apple II, indulge yourself in the Micro-Sci alternative.

See our complete product line today at a dealer near you.

(SPECIAL NOTE TO APPLE III® USERS: Micro-Sci also offers a full range of Apple III-compatible drives. Ask your local dealer for details.)



Micro-Sci is a Division of Standun Controls, Inc. 2158 SOUTH HATHAWAY STREET • SANTA ANA, CALIFORNIA 92705 • 714/662-2801 • TELEX: 910-346-6739 IMC International Markets Corp. Telephone: 714/730-0963 • Telex: 277782-ROBY UR

International Dealer Inquiries...

^{*} Apple, Apple II, Apple III and Disk II are registered trademarks of Apple Computer, inc.
*Pascal Is a registered trademark of the Regents of the University of California.
†CP/Mis a registered trademark of Digital Research, inc.

time we recognized that we couldn't achieve some of the goals. We'll have to take care of them later. We've taken the attitude that Lisa is going to be good and we're not going to sacrifice the integrity of the product for scheduling. We wanted to make a very balanced set of decisions, and so everything, as I say, just started to come together. The floppy disk works well, the mouse works well. the hardware works well, the software is beginning to come, and now we're cranking to get this first release out. But we won't let it be compromised because of scheduling.

Daniels: Part of the difficulty was that both the user interface and the internals—the architecture—of the software are revolutionary. Getting that architecture designed and built was a big scheduling problem. Once we'd done that, we'd built the foundation. Now building the applications is much smoother and has been much easier for us to predict.

Tesler: We didn't know if some of the things we started would work at all, like the way the dot-matrix printer is used and even the way the letter-quality printer is used to print the graphics.

Daniels: No one had ever done that before.

Tesler: Theoretically, it ought to be possible, but it had never been done, and the manufacturer of the printer didn't believe it could be done. It had to be possible in order for this product to do what we wanted, but no one could predict how long it was going to take. When we hired the printer people we told them to do it in two months. It took them a year and a half, but they did it. And then the high-density disk drives are new technology to Apple. A lot of the concepts in there had never been tried before. That was one of the biggest risks. And Apple not only built disk drives for the first time but built revolutionary disk drives.

BYTE: What makes them revolutionary?

Rosing: One of the major things we did was to vary the speed of the disk as you change the track position, so the drives keep constant area density, and that gives them a greater capacity. Second, we used microstepping algorithms on the stepper motor so that if a head gets off track because of changes in humidity and temperature, the intelligent controller can hunt and find the track. So we have much better interchangeability, with much higher density, and we're getting approximately 50 to 60 percent more data on that disk by good systems engineering. Some of the competitive units have a greater capacity, but we think the error rate ultimately suffers. We wouldn't tolerate a serious error-rate problem. BYTE: How does the error rate compare with double-sided doubledensity disks?

Rosing: As for hard-error rates, we're talking about 10⁻¹², and that occurs after so many bits that it's hard to measure. But we're quite delighted that the measurements are impossible to take. Basically that means the errors are low.

BYTE: Did you work more than 40-hour weeks?

Tesler: Each engineer set his or her own schedule. Some engineers work something like Monday through Friday from nine to five. Others work all day at the office, then go home and work all night there. And what an individual engineer does may vary from time to time.

Daniels: These people have pride. They set their own milestones and they want to meet them, so they'll put in extra work to do that.

Tesler: We decided a long time ago that since the project would obviously go on for more than a few months—a couple of years—we couldn't have this constant pressure on everybody, because people would just crack.

BYTE: As individual designers, do you feel that your signature is on that machine?

Tesler: I think that's true of everybody in the group. Even people



C COMPILERS-COMMON FEATURES:

 UNIX VER 7 compatibility • standard float, double, and long support • run time library with full I/O and source • fast compilation and execution • full language.

AZTEC C II CP/M (MP/M) \$199
• produces relocatable 8080 source code • assembler and linker supplied • optional M80 interface • SID/ZSID debugger interface • library utility • APPLE requires Z80 and 16K card

AZTEC C][APPLE DOS \$199
• relocating assembler supplied • APPLE SHELL • VED editor • library and other utilities
• requires 16K card

C86 IBM PC MSDOS CP/M-86 \$249
• directly produces 8088/8086 object code • linker supplied

Manuals—\$30 ORDER BY PHONE OR BY MAIL-Specify products and disk format







CP/M FORMATS: 8" STD. HEATH, APPLE, OSBORNE, NORTHSTAR, ... OUTSIDE USA-Add \$10 In N.J. add 5% sales tax

Allhandson for a swashbuckling adventure with the legendary warship-Old Ironsides!

ANEW experience in arcade-quality graphics in a twoplayer game for

the whole family!

Your arch enemy is armed to the teeth with deadly firepower. A shoot-out could blow you to smithereens.

You're ready for the onslaught! Your warship is perfect—masts, compasses, cannons, broadsides and powder magazines. Your strategy is flawless!

But you've got more than your opponent to contend with! Hiding in the fog by drifting off the screen can snarl even the best tactics!

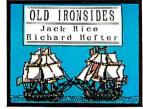
This is a test of skill and daring unmatched in any other micro-

computer game! Your every move is critical. One false step and... KABOOM!

Use keyboard or paddles to play this spellbinding game. Plus...the special Freeze Frame feature stops and starts the action at any point. It's perfect for everyone—the controls are simple, but the strategy and tactics at your fingertips are truly awesome! By Richard Hefter and **JackRice**



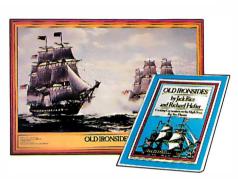
Old Ironsides™ is a registered trademark of Optimum Apple and Apple II are registered trademarks of Apple AF/MS2-B



Distributed by

Xerox Education Publications Weekly Reader

Computer Software Division



What you see is what you get!

Unlike other programs, where the pictures on the packaging and in the advertising bear no resemblance to the screen images, this program delivers precisely what's promised...

- Better than arcade-quality graphics and
- Bright, interest-grabbing packaging!
 FREE full-color 14½" × 20" Old Ironsides poster
- ▶ FREE 32-page Log Book with space to record wins and losses, secret strategies and tactics

Look for OLD IRONSIDES™ in finer computer stores everywhere. Dealers are invited to inquire by calling toll-free 1-800-852-5000.

If there is no store near you, Visa and MasterCard holders may order by calling toll-free 1-800-852-5000. Or, send a check or money order for \$39.95 for each program, plus \$2.00 for shipping and handling (where applicable, please add state sales tax) to Xerox Education Publications/ Weekly Reader, Dept. 16A, 245 Long Hill Road, Middletown, CT 06457.

Apple II and Apple II Plus 48K3.3 DOS

BYTE February 1983 95 Circle 445 on Inquiry card.



try out the in-stock selection of Heath/Zenith microcomputers, peripherals, accessories and software.

Now available at your nearby Heathkit Electronic Center, or through the Heathkit mail order catalog.

You get more with a Heath/Zenith personal microcomputer system! We offer:

dersona..

- 1. Proven, high-performance hardware: Thousands of our microcomputers are proving themselves daily, in the field.
- 2. Vast software library: Three operating systems (including CP/M), languages, word processors, an electronic spreadsheet, versatile utilities and the 500-program Heath Users' Group software library.
- 3. Self-instruction courses: Evaluation and programming courses from Heathkit/Zenith Educational Systems.
- 4. Service support: Before and after the sale consultation by phone, carry-in service.

Test run one of our microcomputers at any of the more than 60 convenient Heathkit Electronic Centers in the U.S.







It's easy to make the Oume Connection.

Call the distributor nearest you to get the best quality printer for your microcomputer.

(416) 677-9555 Ontario Canada

Anacomp/ESCOM Division (213) 516-7480 CA (206) 641-4990 WA (509) 624-1308 WA

Anthem Systems Corporation (415) 342-9182 CA

Audio Visual Services (713) 659-1111 TX (800) 392-7777 TX Only

Bohlig and Associates (612) 922-7011 MN **Butler Associates** (617) 964-5270 MA

Byte Industries (800) 972-5948 CA Only (800) 227-2070 Outside CA

C&G Distributors, Inc. (513) 435-4340 OH (800) 245-1084 Outside OH (412) 366-5056 PA (800) 245-1084 Outside PA

David Jamison Carlyle Corp

(213) 277-4562 CA (415) 254-9550 CA (714)640-0355CA (808) 531-5136 HI (312) 975-1500 IL (201) 946-9669 N.I. (214) 458-0888 TX (713) 530-4980 TX

The Computer Factory (212) 687-5000 NY (914) 793-1300 NY (212) 896-0700 NY (516) 248-6700 NY

ComputingResources, Inc. (702) 825-8800 NV

Computer Mart of New Jersey (201) 283-0600 NJ

Datamex Ltd. (514) 481-1116 Montreal

Canada (613) 224-1391 Ottowa (416) 787-1208 Toronto (604) 684-8625 Vancouver

Data Systems Marketing (714) 540-2312 CA

(714) 540-2312 CA (213) 641-2050 CA (415) 941-0240 CA (916) 891-8358 CA (213) 796-2562 CA (213) 796-2631 CA (714) 560-9222 CA (714) 560-9222 CA (213) 344-7097 CA (209) 237-8577 CA (303) 573-5133 CO (303) 694-1710 CO (313) 254-2830 MI (406) 587-1200 MT (505) 294-1531 NM (503) 297-8444 OR (412) 486-2676 PA (214) 960-1604 TX (713) 789-0803 TX (801) 292-6666 UT (206) 575-8123 WA

Data Technology Industries (415) 638-1206 CA

Data Terminal Mart U403) 270-3737 Alberta (403) 420-1755 Alberta (403) 420-1755 Montreal (914) 288-1555 Montreal (902) 469-3782 Nova Scotia (416) 677-0184 Ontario (416) 495-2001 Ontario (416) 245-4780 Ontario (613) 729-5196 Ontario (604)872-8482 Vancouver

Fourpment Resources (404)955-0313 GA

General Electric (205) 479-6547 AL (602) 278-8515 AZ (415) 436-9265 CA (415) 436-9265 CA (714) 231-0309 CA (203) 628-9638 CT (904) 751-0615 FL (305) 921-0169 FL (404) 452-4919 GA (319) 285-7501 IA (219) 933-4500 IN (317)241-9330 IN (812) 473-6161 IN

(816) 231-6362 MC (314) 965-7115 MO (704) 525-3011 NC (201) 227-7900 NJ (518) 385-4888 NY (716) 876-1200 NY (716) 876-1200 NY (513) 874-8512 OH (503) 221-5095 OR (901) 527-3709 TN (214) 243-1106 TX (713) 672-3575 TX

(801) 973-2253 UT

Gentry and Associates (305) 859-7450 FL

InterACT Computer Systems (305) 331-7117 FL (404) 953-8213 GA (704) 552-7502 NC (704) 254-1949 NC

MicroAmerica (213) 327-6030 CA (800) 262-4212 CA Only (800) 421-1485 Outside CA (617) 449-5807 MA (800) 343-4411 Outside MA (617) 431-7660 MA (214) 235-3616 TX (800) 442-5847 TX Only (800) 527-3261 Outside TX

National Computer (312)459-6400 IL

Office Systems, Inc. (704) 374-0822 NC (919) 274-8423 NC (919) 549-0545 NC

PAR Associates (303) 371-4140 CO (801) 292-8145 UT

Pioneer Electronics (305) 859-3600 FL (305) 771-7520 FL (404) 448-1711 GA (301) 948-0710 MD (919) 273-4441 NC (215) 674-4000 PA

Pioneer Standard Electronics (312) 437-9680 IL (317) 849-7300 IN (313) 525-1800 MI (612) 935-5444 MN (216) 587-3600 OH (513) 236-9900 OH

(412) 782-2300 PA (512) 835-4000 TX

Schweber Schweber (205) 882-2200 AL (408) 496-0200 CA (213) 537-4321 CA (916) 929-9732 CA (213) 999-4702CA (203) 792-3500 CT (305) 927-0511 FL (305) 331-7555 FL (305)331-7555 FL (404) 449-9170 GA (319) 373-1417 IA (312) 364-3750 IL (617) 275-5100 MA (301) 840-5900 MD (313) 525-8100 MI (612) 941-5280 MN (612) 941-5280 MN (201) 227-7880 NJ (516) 334-7474 NY (716) 424-2222 NY (216) 464-2970 OH (513) 439-1800 OH (918) 622-8000 OK (918) 622-8000 OK (215) 441-0600 PA (412) 782-1600 PA (713) 784-3600 TX (214) 661-5010 TX (512) 458-8253 TX (414) 784-9020 WI

Tek Aids Industries Inc. (312) 870-7400 IL (512) 835-9518 TX

Terminal Rentals (602) 258-4466 AZ (714) 832-2414 CA (408) 292-9915 CA (213) 637-3413 CA (714) 235-9268CA (415) 956-4821 CA

Terminals Unlimited (800) 336-0423 Unico (512) 451-0251 TX

Victor Electronics (617) 481-4010 MA Western New York Computer (716) 381-4120 NY



BYTE Interview

who have been with us for only a few months have something in the Lisa that they can look at and say, "That was my idea; that's my code." It's really a group effort. Even marketing got involved in the design effort in various ways, particularly in userinterface issues, product design, packaging, and the style of the manuals. The whole division really got involved.

BYTE: When did you decide to incorporate all the fundamental applications into the system software?

Daniels: At the very beginning. Some applications weren't decided until later, but the integration, the way it all fit together, was a goal from the very beginning.

Rosing: As a matter of fact, we cut out a few more things because we just didn't feel we could manage a project that large. Then we added a couple things back in as we became more comfortable with the development cycle. But we've basically been operating on the same goal for the past two years, with very little change of direction.

BYTE: What was the sequence in the early days? Did you decide what the project had to look like to the end user, and then what software was required, and then. . .

Daniels: Then hardware. In fact, we spent the first six months hammering out the user-interface docket. We had that completely specified before we really started the applications. I think the key to success here is to know where you're going before you start. Tesler: The hardware, the operating system, and the applications were all developed somewhat in parallel, but there was a definite cause and effect. The people who designed the hardware had to make decisions, for example, about whether the disk drive should have a door that you flip open or a button to push, that kind of thing. The designers focused on that aspect of the user interface even before the rest of the user interface. They didn't want the user to be able to accidentally pull out a disk when it was being written on or something. So some decisions were made even before the hardware was designed. There have also been hardware revisions. The first Lisa hardware was here when I came, over two years It's ago. through gone several. . . how many revisions since

Rosing: About four. Each one's been an iteration. We discovered a few things in the early hardware that wouldn't work well. We just took them out because we couldn't do them properly. The rest has mostly been a matter of fine-tuning Lisa so that it's very manufacturable and very reliable.

Tesler: Each time they go through a cycle, the people working on user interface get another crack at it - "Since you're going to revise the hardware anyway, why don't you. . . ?" Or the people doing the operating system say, "The memory-management unit needs to be more general, and since you're redesigning the hardware anyway. . . " So we were able to get in some hardware revisions. Also, that keyboard you saw yesterday is not the final one. After user testing, and because of needing to support the European market, we determined that we really needed a couple more keys on the keyboard, so we made a major change in the keyboard layout.

Rosing: One of the things about this project that's different is that, more than any other I've been associated with, there's a continuous loop for dealing with user issues. We've gone to the software and that has implied a hardware change. We synthesized a lot of different disciplines. The power-off button used to be a traditional button on the back of the machine, but we didn't want to encourage users to turn off their machines that way because if they left a document open, they would lose it. BYTE: Do you expect to find a little initial resistance to the fact that the machine doesn't actually turn off when you push a button? Do you think people are going to say, "Well, I know I can leave it alone now, but I want to make sure it turns off"?

Rosing: Right. It does feel a little funny at first, but after a few times you begin to have confidence that the thing does turn itself off.

BYTE: When you finally got the userinterface specified, did you have a brief description of it that everybody knew by heart?

Daniels: It was about a 35-page document.

BYTE: Thirty-five pages of specifications?

Tesler: We have something called the

User-Interface Standard, and it consisted of those things which would be common to all applications. Also, the year after that document was published some revisions and some changes were made, and as we built applications we found that they had even more in common than we envisioned. Then we would adopt those things as part of the standard.

Daniels: Another thing we've done is

user tests—taking our ideas and bringing in naive users and sitting them down and seeing what their impressions are. That has caused some changes, and I think that's all shown in the quality.

BYTE: Where did you get your naive users?

Tesler: Various places—the bulk of them were new Apple employees. We had a screening process. New Apple employees go through an orientation the first Monday morning they're here. We handed out a questionnaire to the new employees about their previous experience with computers, word processors, video games, and that sort of thing, and then what kind of work they did. Someone in our training department screened all those vitae. I'd go in and say I needed three user test subjects this week who have no word-processing experience but who are secretaries or accounting people to test out our Lisa Calc. She'd go through and pick out some candidates and I'd pick the ones I wanted, based on their experience for whatever test I was trying to run. We had about 50 tests this year in engineering to test out the software.

BYTE: The fact that you responded to the tests speaks well for the end product. The changes in the keyboard, for instance. How recently did you decide to change the keyboard for the final time?

Tesler: There were several changes. Those from the user tests had to do with changing the numeric pad so it had the arrow keys on it so you could move around in the Lisa Calc table. Those tests were run around January [1982], I think.

Rosing: January, and in March we decided to make the change.

Tesler: That was just key-cap legends that had changed. The other change has to do with the number of keys on the keyboard and was primarily for the benefit of international sales, although it did improve the user interface in terms of the positioning of the Enter key and the Extended Character option key, which gives you extended character sets. Those were all done around the same time.

CP/M USERS LOOK OUT:

THE BEST OF BOTH WORLDS INTRODUCING S/S-PASCAL BOTH IN NATIVE CODE AND P-CODE

S/S-PASCAL VERSION 3.0 (Native Code) AND 3.5 (P-Code) FOR 8080 - 8085 - Z80 — REQUIRE ONLY 32K OF MEMORY!

A bilingual compiler! S/S-PASCAL speaks English and French (or Spanish or German or Italian . . .)

COMPILE FAST IN P-CODE then when your program is ready

EXECUTE FASTER IN NATIVE CODE

Available in the following formats: 8" SD, North Star Osborne, Micropolis Mod II, Apple CP/M, Superbrain

Write to get the whole story, or better send \$40.00 for Demo Discette and tutorial manual (150 pages)

Demo 1: Compiler without READ statements Demo 2: Source limited to 50 statements

COMPARE!	Execute (seconds)	Total Size (bytes)
S/S-PASCAL (Native Code)	12.5	1300
PASCAL MT + *	19.0	3043
PASCAL/Z*	109	3328
S/S-PASCAL (P-Code)	120	13000
UCSD PASCAL*	239	8282
PASCAL/M*	450	21933

Re: BYTE, September 1981, page 180 A high level language Benchmark *TRADEMARK

- Standard PASCAL features
- Generates optimized native code
- Compiles directly into .com file
- · External assembler subroutines
- Random access files
- 14 digit BCD floating point reals
- Chaining and overlays
- Dynamic strings
- Powerful string manipulation
- · Direct access to memory
- Address and size functions
- NEW, DISPOSE, MARK, RELEASE
- · ASSIGN, RENAME, ERASE
- and more . , ,

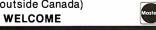
S/S-PASCAL NATIVE CODE & P-CODE S/S-PASCAL NATIVE CODE ONLY S/S-PASCAL DEMO DISCETTE (& MANUAL)

\$ 360.00 \$ 295.00 \$ 40.00

VISA

(Cdn. \$ in Canada, U.S. \$ outside Canada)

DEALER INQUIRIES WELCOME



P. O. Box 197 Armdale, N.S. Canada B3L 4J9

SOFTWARE INC.

(902)

Apple Polishing.



New software for your Apple*III. Only from Quark.

Now you can add three **new** Quark software products to your Apple III.

Advanced programs which offer you the technical sophistication you need. With the simplicity of operation you want. All at intelligent prices.

Case-in-point: <u>Catalyst</u>[™]. With this hard disk program, you'll only have to boot your system once. Which means you may not have to touch another floppy disk all day. And the price, to coin a phrase, is user-friendly. Only \$149.

You'll also be delighted with <u>Discourse</u>™ A spooler that saves you a lot of time. Because it lets you use your computer while you're printing other reports. Plus, you can queue up to 14 documents. The price is \$125.

And if you need an automated appointment calendar, the answer is Quark's new $\underline{\text{Vigil}}^{\text{TM}}$. No matter what your Apple III is doing, Vigil will alert you to the next event on your busy schedule. The price is attention-getting, too. Just \$95.

Your dealer wants to show you these exciting new programs today. And while you're there, be sure to ask for our free brochure: <u>Apple Polishing</u>.

Or write us directly.

You'll discover how to put Quark's unique line of software to work for you. And then your Apple III can really shine.



1433 Williams, Suite 1102 Denver, CO 80218 (303) 399-1096

Apple is a registered trademark of Apple Computer, Inc.

BYTE Interview -

Rosing: The interesting thing is that we were at the stage in the program where the decision to make even what sounds like a simple change takes six months to percolate through because it's not a simple engineering change—it's manufacturing, tooling, documentation.

Daniels: We made one legend change in June or July – the Apple key. When was that?

Tesler: July, and it's just now showing

BYTE: A legend change?

Tesler: You saw two keys that said Command on them. The new version has only one, and instead of saying Command it has a picture of an apple on it. The reason is that the key's used as a shortcut to choose a menu command. If you look at a menu, on the right you'll see this little apple symbol and a letter. If you hold down the Apple key and the letter, you get the command. We couldn't find any way to symbolize the Command key that would fit nicely in a menu and be recognizable to people. We tried and tried. Finally we decided that the apple looked nice and had a nice sound to it—"Apple X," "Apple R" - and it keeps Apple in the mind of the user instead of "control" or something else. It's a symbol that everybody using this machine will recognize instantly, so we decided to put it on the key as well as on the screen. To finish the artwork in time to get the machines to test users in time to get responses, and so on, the change had to be in by a certain date. The decision was made only hours before the deadline.

BYTE: Are there going to be two Command keys without legends on them?

Tesler: No, only one. We studied IBM and DEC and other keyboards and found that they all have just a single Command or Control key on the left-hand side. We also really wanted to put an Enter key on the main keyboard because we would like to be able to offer a configuration in which an alphabetic keyboard and a numeric keyboard are independent – for, say, a company that does only word processing. Word processors don't need the Clear function, but they do need the Enter function, so we wanted to be able to have the Enter key on the main keyboard; that way, even people without a numeric keypad can hit Enter. Again, on IBM and DEC keyboards the Enter key is standard; on many of those keyboards, that's the standard position for the Enter key. So we decided to be more like other companies. The Enter key also gives us the option of removing the numeric keypad without losing an important function. And then the option keys were put on the side of those, and there we decided we did need two option keys, left and right, because they're used very much like shift keys for typing, and in Europe it would be very important to be able to touch-type for-



Software Catalog. FREE. Get the lowest price on every software program you need. 1/3 off list price guaranteed. And look what else you get from ITM:

Unlimited Consultation! ITM's consultants work with an amazing database indexed with over 300 software selection criteria plus thousands of in-depth product reviews. You'll get the programs that are right for you. Quickly Easily It's the most sophisticated consultation service in the industry. Call toll free!

Over 2.000 programs to choose from. Hundreds added every month. All categories. All formats.

See any program demonstrated. Order any non-entertainment program for a risk-free, thirty-day trial. Full refund if not completely satisfied.

No minimum order. Buy just one program if you like. Quick shipments

All this, and more, is yours for an annual fee of \$100. Call ITM now. Or, mail the coupon today and receive our FREE Software Catalog. Save hundreds—even thousands—of dollars on all of your software purchases with ITM.

American Express, Visa, or MasterCard honored. Call toll-free today.

(800) 334-3404

In California (415) 284-7540

Software	Catalog.	FREE.
----------	----------	-------

Byte 283

☐ YES. Send complete information for my review. Please include a free copy of ITM's Software Catalog.

	TTTA
NAME	1 1 1/1
COMPANY NAME	Software Division
ADDRESS	We make software buying simple.
CITY/STATE/ZIP	Attn: Stevan Cloudtree

Lafayette. CA 94549-4292 (800) 334-3404 or ☐ Individual ☐ Dealer ☐ Consultant ☐ Company (415) 284-7540

Check The Chart Before You Choose Your New 16-Bit Computer System.

Columbia Data Products'
New Multi-Personal® Computer,
Featuring IBM-PC® Compatibility,
Excels In Professional, Business
And Industrial Applications.
Check it out.

Columbia Data Products' MULTI-PERSONAL® COMPUTER can use software and hardware originally intended for the IBM® Personal Computer . . . while enjoying the flexibility and expandability of all Columbia Data's computer systems.

Available operating system software includes singleuser MS-DOS® or CP/M 86® or multi-user, multi-tasking MP/M 86® or OASIS-16®, with XENIX® available soon, providing users with a host of compatible software packages for personal and professional business and industrial applications. A large selection of higher level languages are also available, including BASIC, FORTRAN, COBOL, PASCAL and MACRO Assembler.

Our standard 16-Bit 8088 hardware configuration provides 128K RAM with parity, two RS-232 serial ports, Centronics parallel printer port, interrupt and DMA controllers, dual floppy disks with 640K storage, Winchester disk and keyboard interfaces, and eight IBM-PC compatible expansion slots . . . and lists for only \$2995. Winchester hard disk configurations, featuring cache buffer controllers for enhanced disk access performance are also available, starting at \$4995.

So, when you need to grow, why gamble and hassle with independent third party hardware and operating system vendors which may or may not be compatible... not to mention the hidden expense and frustration of implementing peripheral drivers in the different operating systems and upgrades? Who needs the finger-pointing when things don't work out?

After you review our chart, you will agree . . . for overall 16-Bit microprocessor superiority, expandability, flexibility, compatibility and real economy, Columbia Data is your total source.

Our Multi-Personal Computer . . . the 16-Bit system born to grow!

Get yours now.

Circle 78 on inquiry card.





MAIN FEATURES	CDP-MPC	IBM-PC*	OTHERS
Microprocessor	16-Bit 8088	16-Bit 8088	?
HOED N	8-Bit Z-80 (Opt)	4014 050 141	
USER Memory	128K-1 Mbytes	16K-256 Kbytes	?
IBM-PC Compatible Expansions Slots Beyond			
Professional Configuration	8 Slots	0	?
Resident Floppy Disk		Dual 160K (Opt)	7
Storage	Dual 320K (std)	Dual 320K (Opt)	
Resident Cache Buffer		The Market St.	14470
Hard Disk Storage	5M/10M	ikashi . a a ye	?
OPTIONAL OPERATING SY	STEMS (Supported	by Company)2	
MS-DOS (PC-DOS)	Yes	Yes	?
CP/M 86	Yes	Yes	?
MP/M 86	Yes	-	?
OASIS-16	Yes	_	?
XENIX	Soon	_	?
OPTIONAL HARDWARE EXP	PANSION BOARD (Supported by Com	pany)
RS-232 Communications	Yes	Yes	?
B/W and Color Display			
Controller	Yes	Yes	?
Expansion Memory	Yes	Yes	?
Z-80 CP/M-80 Board	Yes		?
Cache Buffer Hard Disk	Yes		?
Time/Calendar Board	Yes		?
IEEE Bus Controller	Yes	The Hard	?
8" Floppy Disk System	Yes	- h - 189%	?
8" Hard Disk System	Up to 40 Mbytes	_	?
Tape Cartridge System	Yes		?

¹For comparison purposes, typical professional configurations consist of 16-Bit 8088 Processor, 128K RAM with Parity, Dual 320K 5-inch Floppies, DMA and Interrupt Controller, Dual RS-232 Serial Ports, Centronics Parallel Port and Dumb Computer Terminal or Equivalent.

²Columbia Data Products also supports CP/M 80* with an optionally available Z-80 CP/M Expansion Board.

*As advertised in BYTE Magazine, August 1982

COLUMBIA DATA PRODUCTS, INC.

Home Office: 8990 Route 108 Columbia, M® 21045 Telephone 301-992-3400 TWX 710-862-1891 West Coast: 3901 MacArthur Blv.d. Suite 211 Newport Beach, CA 92663 Telephone 714-752-5245 Telex 277778

Europe: P.O. Box 1118 450 Moenchengladbach 1 West Germany Telephone 02161-33159 Telex 852452

IBM is the trademark of International Business Machines. CP/M and MP/M are trademarks of Digital Research. OASIS is the trademark of Phase One. MS-DOS and XENIX are trademarks of MICROSOFT.

eign alphabets for international correspondence, mathematical symbols, and other special characters. So there were some trade-offs. We didn't want to just keep jamming two of every key on the keyboard, so we decided what the priorities were and ended up being fairly close to the industry standard. We have one Apple key, one Enter key, and two Option keys.

BYTE: The user-interface design seems to have been difficult.

Tesler: That was the hard thing that affected the most people. A lot of software and hardware engineering issues were very difficult, but they affected only a few people. Interface issues affected half the division because Training, Publications, Marketing, and the software person implementing the application all had an opinion. People like us who were overviewing all the applications had opinions, in-between managers had opinions, kibitzers on the side had opinions, too. Not everybody can

talk about what gate to use in some circuit or what routine to use in some program, but everybody can talk about the user interface. So we had to accommodate all of these things. And it turned out that good ideas and good criticisms came from everywhere. We had to come up with some objective way to decide. That's why we established the methodology which involved user testing. We had a procedure for proposing changes, reviewing the changes, narrowing it down to a few choices, with certain criteria like consistency and parsimony. And then we actually implemented two or three of the various ways and tested them on users, and that's how we made the decisions. Sometimes we found that everybody was wrong. We had a couple of real beauties where the users couldn't use any of the versions that were given to them and they would immediately say, "Why don't you just do it this way?" and that was obviously the

way to do it. So sometimes we got the ideas from our user tests, and as soon as we heard the idea we all thought, "Why didn't we think of that?" Then we did it that way.

BYTE: Bruce, could you say something about the software architecture?

Daniels: There's an operating system underneath that we built ourselves because we felt that the ones that were out there didn't quite meet our needs.

BYTE: What does yours do that others don't?

Daniels: It's not just what it does, but what it doesn't do. Some other operating systems are basically timesharing systems like Unix that have a lot of features that we don't need, and why take up extra space for that? We wanted a system that the user didn't have to be experienced to understand, and it had to be very reliable. It had to maintain the user's data and keep it there. It also had to



Multi-Reasons to Choose CompuPro's Multi-User System 816/C™



- 1. Run any mix of 8 or 16 bit software at any terminal.
- **2.** Lots of storage. 384K of RAM (expands to 1 MByte), 2.4 million (expands to 4.8 million) characters of floppy disk storage, provisions for hard disk storage.
 - 3. Nine serial ports for terminals, printers, modems, etc.
 - **4.** Unparalleled single-user operation, as well as optional expansion from 3 users to 16 users.
 - 5. Superior warranty. 1 year limited warranty.
- **6.** Bundled software. System 816/C runs over 3,000 CP/M® programs, and comes with MP/M™-816™, CP/M 2.2, CP/M-86, M-Drive™, SuperCalc™ (Sorcim's powerful 16 bit spreadsheet), and dBase II™ data manager.
- **7.** Ultra-high performance. As *Interface Age* said, "The (8 bit) 8085 was more than a third faster than any 8 bit micro we have tested to date...the (16 bit) 8088 (was) almost twice as quick as the identically-engined IBM Personal Computer." You will appreciate this extraordinary level of performance when deadlines loom and time is of the essence.

System 816, MP/M 816, and M-Drive are trademarks of CompuPro; CP/M, CP/M-86, and MP/M are trademarks of Digital Research; SuperCalc is a trademark of Sorcim; dBase II is a trademark of Ashton-Tate. Terminals courtesy of Qume Corp.



CompuPro division, Godbout Electronics, Box 2355, Oakland Airport, CA 94614 Authorized CompuPro Systems Centers specialize in business, industrial, and scientific microcomputing. They can show you why System 816/C represents the highest expression of 8 and/or 16 bit multi-user computing.

Circle 90 on inquiry card.



Tallgrass Technologies presents a family of Winchester HardFiles and removable cartridge media that has set the industry standard on performance and reliability. With integral tape backup and formatted capacities from 6.25 Mb to 20 Mb, Tallgrass has a HardFile to answer the most serious data management problems.

TALLGRASS SUPPORTS LOCAL AREA NETWORKING

PCnet is a low-cost solution to your IBM PC's Networking needs. PCnet enables IBM PC users to share HardFiles and floppy disks, printers and communication lines. For more information contact:



487 Sinclair Frontage Rd. Milpitas, CA 95035 • (408) 942-8660

Let Tallgrass introduce you to our family of Winchester subsystems and watch your personal computer transform into a powerful data processing system.

From \$3095.00 suggested retail including integral backup.



9207 Cody Overland Park, Kansas 66214 (913) 492-6002

Available from COMPUTERLAND and other participating dealers.

BYTE Interview

support things like graphics, the windows that we have on the screen, the mouse, and so forth. We didn't really find an operating system that met our needs, so we felt we had to go build our own. We built the other features on top of this—the support for the windows, the support for graphics, the support for multiple fonts, the support for printing. It's really quite a rich architecture. At least half of the software is in this foundation software.

BYTE: How large is that in bytes? How much code is in that foundation software?

Daniels: Well, source code is something like 10 megabytes.

Tesler: Object code is about half a megabyte.

BYTE: That's what's there before you put the application programs in – half a megabyte?

Daniels: Yes.

BYTE: After you specified the user interface, what list of hardware requirements did you come up with?

Rosing: Well the main list that was

Rosing: Well, the main list that was specifically user interface would be the bit-mapped graphics display and the resolution of approximately 700 pixels across in the horizontal dimension, the mouse, and the doorless disk drives with the eject button rather than an eject handle. They determined a lot of the hardware design. We had other user-interface considerations, though. We wanted to make the system very easy for its users to service—I presume you've seen it break apart. Servicing really is simple. It took a moderate amount of extra product cost to get that feature in there. And that's a part of the even more global user interface, how people perceive the whole system.

BYTE: Why did you choose the 68000 microprocessor and what alternatives did you consider?

Daniels: We thought its architecture was very broad and strong and would take us through the '80s, and we wanted that. We wanted something to support the graphics, and we thought that processor gave us what we needed then. The 68000 was a bit of a gamble because it was very

young when we got on it. We were getting one sample at a time from the local Motorola engineer here.

BYTE: Do you think the 68000 will be the dominant processor in the next few years? Is it going to overcome the 8088, the 8086?

Rosing: I would speculate that for high-end applications with very computer-intensive, graphics-intensive needs, the 68000 will become dominant.

Daniels: But the 8086 has such an installed base going already, I think that alone would carry it. . .

Tesler: You mean numbers of actual units with the 68000 in it, or the number of different products?

BYTE: Both of those questions.

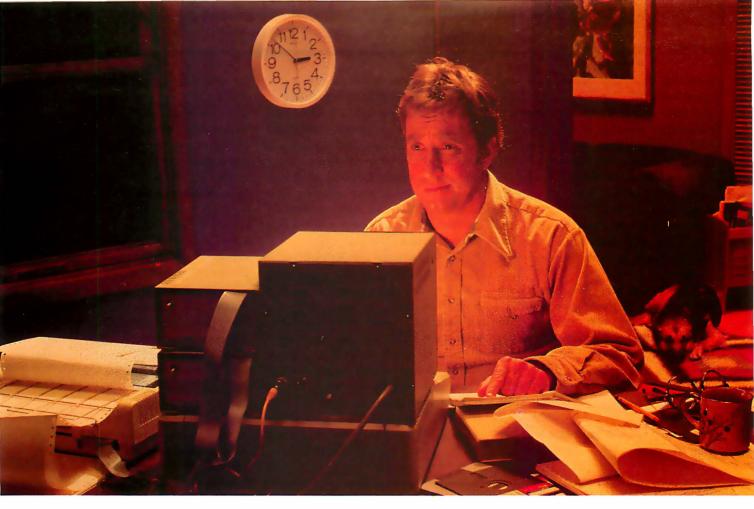
Tesler: Well, we're putting 68000s in the units we'll sell, so that will mean more units with 68000s. We expect to sell a lot of machines.

BYTE: You've got a 68000 machine with a lot of memory in there, and not too much special-purpose hardware. Why did you decide to do it that way instead of using some versatile hardware chips, like the NEC 7220, for video display?

Daniels: We're very much boosters of bit-mapped graphics, and in fact hardware support for bit-mapped graphics is pretty small. All you need is sort of a shift register. We thought the flexibility that would give us in graphics and the things we could do in user interface with bit-mapped graphics was well worth the price.

BYTE: But doesn't the 7220 have bit-mapped graphics itself?

Rosing: Well, there were a couple of practical considerations. The NEC 7220 didn't exist when we designed Lisa, although we knew it was planned. The second consideration was that the 7220 cost more than the TTL [transistor-transistor logic] hardware needed to implement the equivalent functions. And the third consideration was this: because we were able to interleave the memory and display cycles, we were able to essentially get data out of the memory at very little penalty. Using a 7220 would actually cost considerably more in terms of system



IF MetaCard DOESN'T IMPROVE YOUR WORKING CONDITIONS WE'LL GIVE YOU YOUR MONEY BACK.

It's almost three in the morning. You knew just one more line of code and your program would be finished. That was seven hours ago. It's hard work developing good software. Writing it on the Apple II is no exception. Although we can't promise to get you to bed by eleven o'clock, we can make your job a lot easier.

When we developed MetaCard, a co-processor system for the Apple II, we designed in 128K bytes of on-board memory with parity. Enough memory to run the most powerful development tools available. We included memory expansion capabilities beyond 128K.

And we made sure it could run all three operating systems for the IBM PC. MetaCard does more than make your job easier, it opens up new development areas. If you want to create or run more powerful applications software for the Apple, or for the IBM PC or other 8086/88-based systems, you should have a MetaCard in your Apple. MetaCard supports the most popular development languages available for MS-DOS, CP/M-86 and UCSD p-System Version IV. Languages like Pascal, C, COBOL,

FORTRAN, BASIC and almost all others operate at peak performance. MetaCard enables you to continue to use most of the popular peripherals for your Apple II, plus all of your existing software. And with many best selling applications for the IBM PC available soon, you can use your Apple in new and developing areas.

MetaCard uses the Intel 8088 processor and operates at a full 5 Mhz. And MetaCard's real-time clock, external power supply, parity checking RAM, and power-up ROM diagnostics give you the features and reliability you demand.

Satisfaction Guaranteed

We know you'll still work through the night.
But if MetaCard doesn't improve your
working conditions, return it within
30 days, and we'll send your money
back. No questions asked.

MetaCard, complete with documentation, MS-DOS and UCSD p-System (CP/M-86 optional) and power supply, is available in both 64 and 128K configurations, priced at \$980 and \$1,150 respectively. The MetaCard System Operating Manual is available for only \$25.

For more information write us today,

Metamorphic Systems, Inc., 8950 Villa La Jolla Drive, Suite 1200, La Jolla, CA 92037. Or call us today to order yours at

800/228-8088

In California call 619/457-3870.

MetaCard is a trademark of Metamorphic Systems, Inc., Apple — Apple Computer Inc., Intel 8088 — Intel Corporation, CP /M-86 — Digital Research Corporation, MS-DOS — Microsoft, UCSD p-System — University of California, IBM PC — IBM

Circle 253 on inquiry card.



performance. And there was one more consideration: with the 7220, you can't access the display memory bank when the chip is refreshing the CRT, and that limits the time you can access it to about 10 percent of what we have, which would drastically affect performance. We can access memory any time. For equivalent performance, we would have to use two 7220s, and that would push the cost and the "real estate" beyond what we have.

BYTE: On the other hand, software doesn't get written overnight. . . there's a certain cost to that. You know, this is very software-intensive. Rosing: Most of the software that supports the graphics took three years to write, but no hardware in the world can duplicate what that software does.

BYTE: Really? The software is faster than the hardware?

Rosing: No, not always faster.

BYTE: Its functionality is greater?

Tesler: Yes. The graphics package lets us draw circles, rectangles, ovals, and rectangles with rounded corners. It also automatically handles clipping on nonrectangular boundaries. If you have one object over another, you can draw the one behind without splashing the pixels on top of the one that's in front. That's a . . .

BYTE: A software revolution?

Tesler: A very unusual capability, which no one else has in that general form. The other implementations are all either very, very expensive hardware—the \$100,000 class—or in software, which isn't really that general and performs much much worse. There's nothing in the same class as our software as far as capability and speed. Of course, there is graphics software that's faster and hardware that's faster, but it doesn't have

anywhere near this capability.

BYTE: Do you have a Xerox Star here that you work with?

Tesler: No, we didn't have one here. We went to the NCC when the Star was announced and looked at it. And in fact it did have an immediate impact. A few months after looking at it we made some changes to our user interface based on ideas that we got from it. For example, the desktop manager we had before was completely different; it didn't use icons at all, and we never liked it very much. We decided to change ours to the icon base. That was probably the only thing we got from the Star, I think. Most of our Xerox inspiration was Smalltalk rather than Star.

BYTE: What does Lisa have that the Star doesn't have?

Tesler: We're talking about graphics capability. You originally asked why we didn't use graphics hardware. Our graphics primitives in software are more general than the Star's, so they perform better. We have a faster and more general ability to draw on the screen a picture of multiple graphical objects in different shapes, to have one window that uncovers another, and to repaint just the parts that are uncovered.

Daniels: Look at the desktop managers of the Star and Lisa. With the Star, you can only put them at fixed places on the screen so you know they don't ever overlap. On ours, you can put them any place you want. It's that generality that allows us to have arbitrarily shaped things and covering each other up and . . .

BYTE: Documents or forms, shapes, or anything. . .

Daniels: Yes.

Tesler: Right. We have curves in it. Everything in the Star, you'll notice, is really rectangular, and our things can have curved edges and that sort of thing.

BYTE: Another hardware question: How many microprocessors are in the machine, what are they, and what do they do?

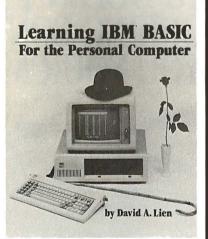
Rosing: Let's see. One to scan the keyboard, in the keyboard housing proper; a second one that receives the

A MUST FOR YOUR IBM PC

Programming Made Easy

Stop struggling with incomplete, disorganized IBM-PC Manuals. Learning to program can be a relaxed, enjoyable experience with Dr. David Lien's definitive 450-page handbook for the IBM-PC. Learning IBM BASIC's easy-to-follow format will soon have you writing custom software for your PC — even if you're completely new to computers.

30-Day Money Back Guarantee
You just can't lose. If you're not totally satisfied with this book for any reason, return it to CompuSoft in salable condition within 30 days for a full refund. Fill out and mail the coupon today, or call our 24-hour orderline at 800-854-6505; in California call 619-588-0996 (8:00 a.m. – 5:00 p.m.)





Please send copies o plus \$1.65 shipping and han surface shipping and handli	f <i>Learning IBM BASIC</i> at \$19.95 each (Calif. residents add 6%), dling per book within the U.S. Foreign orders, include \$2.50 ng per book.
Total Enclosed	Name
Address	
City/State/Zip	
☐ Check ☐ Visa	☐ MasterCard
Account #	Expiration Date
Signature	Please allow 4 to 6 weeks for delivery.

Inventory Reduction Sale Many items at cost. Order Now.

	COMIT OT LING	
Apple II 48K		\$1065
Atari 800 48K		\$655
Chamelion (portable IBN	M type)	\$1995
Franklin ACE1000		\$955
Kaypro		\$1695
IBM PC		SCALI
Osborne		SCALI
NEC APC		\$3150
Slimline S-100		nder \$2000
Syscom 2 (like Apple)		\$725
VIC 64	Ask fo	r Package!!
	WALDERSON TO KIRCLEY CO.	
	PRINTERS	1
7,000		140

COMPUTERS

PRINTERS	
Epson MX-80 F/T	. \$435
Epson MX-100	. \$645
Brother/Comrex 17cps daisy	. \$745
F-IO Starwriter	
NEC 7710-1	\$2065
NEC 7730-1 (lor IBM PC)	\$2095
Okidata Entire line at dea	er cost
u84AP	. \$935
u92A (160cps)	. \$525
Prowriter	
Prowriter II	
Smith-Corona TP-1	. \$550
Star Gemini-15	. \$495

VIDEO MONITORS

The best value in Monochrome is	s.																YNAX
The best value in RGB is																1	TAXAN
Amdek 300G 12" green		٠.															\$145
Amdek 300A amber																	\$160
Amdek 310G for IBM																	\$170
Amdek 310A amber																	\$180
Amdek Color i														. ,			\$325
Amdek Color II																	\$685
Oynax 12" green. 20MHz																	\$129
Dynax 12" amber, 20MHz																	\$145
Taxan/JCS 12" green																	\$135
Taxan/JCS RG8-1																	\$345
BMC. Sanyo. USI				W	e	ex	κp	ec	ct	п	e	W	1	0	w	ŗ	oricing
	by	th	e	tin	10	th	ni	s	ac	1	ap	p	e:	aı	rs	i.	SCALL

FOR APPLE & FRANKLIN

Corvus all items	BIG DISCOUNT
dBase II	\$395
Z-80 Card—Applied Engineering	
1-9 pcs	\$195
10+ pcs	\$175
Universities, clubs, and dealers welcome.	
Hayes Micromodem II	\$275
Rana Elite I	\$285
Rana Elite 11—double	\$455
Rana Elite III—quad	\$585
8" drive, 2MByte Floppy System	\$1695
Ominivion 80 column, with software	\$165
Parallel Interlace with cable	\$58
Prometheus 16K RAM	\$75
"Graphitti (Printer/Graphics Int.)	\$110
"Expand-a-Ram. up to 128K	\$195
Videx Videoterm 80 column	\$245
Visicalc 3.3	\$179
VR Data 5M8 Hard Disk with error correction	
MODEMS	

Hayes Smartmodem 300	
Hayes Smartmodem 1200	. \$515
Novation CAT	. \$149
" O-CAT	. \$168
" 212 AutoCAT	\$585
" 103 AutoCAT	. S215
Universal 103 Line Powered	. \$165
"", auto answer	S205
" 202, 1200 baud, half duplex	S185
" 212. 1200 baud. full duplex	

FOR IRM PC

TOITIDINI	
AST RESEARCH CARDS NOW INCLUDE S TOR SOFTWARE	
AST ComboPlus 64K with Parallel, Seri	
AST MegaPlus 64K, expandable to 512K	
Corona 5MB Hard Disk	\$1495
Parallel cable	
Serial cable	
RAM sets. 64k with parity	
Tandon TMM 100-2 drive	\$265
	BERTHAN START

ATARI

Atari 800 48																		
810 Disk								 								 		\$45
830 Modem								 										\$15
850 Printer I	nter	fa	ce															\$16
Printer cable								 										\$3
Serial cable																		\$3

CHAMELEON "The Compatible Computer

- . Runs IBM PC & Z-80 software
- 128K RAM. expandable to 700K
- Dual 320K drives
- · PC style keyboard
- 9" green display. 80 ×25 with graphics
- . Software: DOS, word processing, spread sheet

You must register your order now to receive the introductory price of \$1995

S-1000 THINLINE MAINFRAME

- · Power and mounting for 2 thinline 8" drives
- . 6 slot \$-100 motherboard, cage, power
- Fan. EMI filter, connector cutouts

Compare in features and quality with units costing hundreds more.

OHME DRIVES

- Aniar Duiaes	J. R.
OT242, 8" thin. dsdd	S485
DT842. 8" std. dsdd	\$495
DT542. 5¼". dsdd. 48 tpi	S295
DT592, 5¼", dsdd, 96 tpi	\$385
We also carry Mitsubishi. NEC. Shugart, and Tandon	

S-100 THINLINE COMPUTER SYSTEM

- . 7.RO AMHZ GAK CP/M
- 2 Thinline drives. B", 2M Byte
- Mainframe
- Add any standard video terminal and printer

JUST \$1895

ADD-ON DRIVES FOR ZENITH Z-100 COMPUTERS

- 2 Thinline 8" drives, double sided, 2MByte
- · Thinline cabinet, vertical, power supply, fan, cable

COMPUPRO (Godbout)

Co-Processor 8086/8087 8 MHz .	 			 		 			\$615
Dual Processor 8085/8088 6MHz	 		 						\$385
Disk 1. Floppy Controller	 		 						\$490
RAM 17. 64K CMOS. 12M Hz	 		 						\$515
RAM 21. 12BK Static. 12MHz	 		 	٠.					\$1155
M-Drive, 128K	 								\$1150
S-100 Mainframe, 20 slot, rack	 								\$795
S-100 Mainframe. 20 slot. desk .	 								\$735
System Support 1. 1/0									\$335
Interlacer 3. B serial									\$615

WABASH DISKETTES

5 4". Single Sided. Double Density with Hub Ring \$17.50/box

EPSON RIBBONS

MX-80 black	 \$25/3pcs.
MX-10 black	 \$39/3pcs.

TELEVIDEO TERMINALS

Extra Memory Pages (kit) INCLUDED—No Charge	
TVI925 w/2nd page	\$745
TVI950 w/2nd. 3rd. 4th page	\$945

MEMORY IC's

4164 64K Dynamic 200ns													\$7.25
4164 64K Dyanimic 150ns					. ,			. ,				,	\$7.95
4116 16K Dynamic 200ns								 					\$2.00
2716 Eprom													\$4.00
2732 Eprom								 					\$6.50
6116 2K×8 Static RAM. 20	Ons							 					\$5.00
6116", 150ns						,							\$5.50



IRONSIDES COMPUTER CORP.

(213) 344-3563 (800) 528-9537 18546 Sherman Way, Suite #110, Reseda, CA 91335

Verify prices by phone. Shipping is extra except within the Continental U.S. on prepaid orders. California orders, add 61/2% sales tax.

keyboard commands and keys up mouse events; the 6504 that controls two floppy disks; a Z8 microprocessor in the hard-disk controller—it's an intelligent controller; and then, of course, the 68000. That's five.

Tesler: Almost every major chip manufacturer except for one.

Rosing: And with only one exception all our I/O (input/output) cards have microprocessors.

BYTE: You say that the magnetic read/write head in the disk drive is microprocessor-controlled in order to let it be more sensitive to variations in the alignment. Is that the 6504? Rosing: Yes.

BYTE: What is the microprocessor that handles the keyboard and the mouse?

Rosing: That's a National COPS. We tried to pick the processor that we felt was best for each particular job.

BYTE: The memory is 64K-byte chips?

Rosing: Yes, 64K chips.

Tesler: On the memory we have parity and. . .

BYTE: What part of the memory is video memory?

Daniels: Some area in the main memory can be the video.

Tesler: Any area at all. In fact, if you noticed yesterday in the demonstration, when we're developing software, we need debugging information to be displayed for the programmer, but we don't want it to come out on the same screen that the user is seeing, so we had this magic toggle we were hitting that flipped between two screens. There are really two different areas of memory with a bit map in each. The software can switch between the two to display each in turn. BYTE: But they're within the main memory?

Tesler: Yes, absolutely. Anywhere in memory. Take any number of consecutive bytes and say that's the bit map.

BYTE: Is anything else in main

memory, or is the rest of it all available to the user? Is anything else mapped to the memory?

Tesler: Oh, I see what you're saying—the shared memory. Shared memory with I/O is not main memory. The I/O memory is in the I/O cards.

Rosing: It's not in the memory, but it's accessed like main memory, from the 68000 bus.

Tesler: It's in the address space, but it's not in those 64K chips.

BYTE: A certain address is really an I/O port, is that right?

Rosing: Yes; it's the top physical address of the 68000.

BYTE: Did you consider voice as part of the user interface?

Rosing: Yes. We looked at it pretty hard and at one time in the early system we actually had a CVSD-based voice subsystem in the computer, and we took it out because we didn't feel it achieved the quality we wanted to have associated with this system.

BYTE: What does CVSD mean?

Rosing: Continuously Variable Slope Delta modulation. It's much easier to say alphabet soup. We've thought about voice; it's part of our network architecture and will appear in the future, but only when we feel the technology's right so we can be proud of what we offer.

BYTE: That's both input and output? Rosing: Right. We look at voice as being three problems. There's store and forward, which is just moving voice messages around, like a glorified answering machine. Second is text to voice; and third, of course, is voice recognition, or voice to text. The last one's the hardest of all, but we look at voice technology as something we have to approach in a unified way.

BYTE: What about the programmable serial ports? What chip is used there?

Rosing: They use the Zilog SIO. That was one of the last major changes we made in the hardware design. We did it because we had two high-speed ports with less board space, and the Zilog SIO chip supports asyn-



by the time you're finished with a Database Management System you can rely on you've spent hundreds and maybe thousands of dollars. At Thinkers Soft Inc., the price of computing is more reasonable than you think. Data-Vu™ by Thinkers Soft Inc., has three features which makes it one of the most powerful data management facilities available.

1. Automatic Form Generator

Allow you to generate forms on the screen and use them as a personalized tool to enter data on the data base.

2. Relational Database Manager

Designed for the small firm or professional who would like a convenient but inexpensive data base management system.

3. The Report Generator Program Specifically designed to retrieve information from the data base with simple statements, perform arithmetic operations, and much more.

4. Automatic Menu Generator

Allows you to generate menus and use them as a personalized tool to run your application programs.

ALL THIS FOR

\$149 (Disk & Manual)

CP/M* Compatible

Specify Diskette Format. \$2 additional shipping costs per diskette. Prices subject to change without notice. 'Registered trademark of

Thinkers Soft, Inc.

Call Today

Dealer Inquiries Invited

P.O. Box 221, 221 Clinton Rd., Garden City, NY 11530 (516) 294-8104
We Accept Master Charge

64K STATIC RAM MEMORY



S-100 STATIC MEMORY BREAKTHROUGH

Finally, you can buy state-of-the-art S-100/IEEE 696 static memory for your computer at an unprecedented savings.

Memory Merchant's memory boards provide the advanced features, quality and reliability you need for the kind of operational performance demanded by new high-speed processors

Completely Assembled.

These memory boards are not kits, nor skeletons — but top-quality, high-performance memories that are shipped to you completely assembled, burned-in, socketed, tested and insured with one of the industry's best warranties.

Superior Design & Quality.

Memory Merchant's boards are created by a designer, well known for his proven ability in advanced, cost-efficient memory design. Innovative circuitry provides you with highly desired features and incredible versatility.

Only first-quality components are used throughout, and each board is rigorously tested to assure perfect and dependable performance.

No Risk Trial.

We are so convinced that you will be absolutely delighted with our boards that we extend a no-risk trial offer. After purchasing one of our boards, you may return it (intact) for any reason within 15 days after shipment and we will refund the purchase price (less shipping).

NEW S-100 PRODUCTS COMING SOON:

- * DUAL 8/16 BIT CPU BOARD
- * 128K 8/16 BIT STATIC RAM
- * 256K 8/16 BIT DYNAMIC RAM

\$629.

48K PARTIALLY POPULATED \$519. 32K PARTIALLY POPULATED \$409.

64K RAM, MODEL MM65K16S

- 64K × 8-bit
- Speed in excess of 6 MHz
- Uses 150ns 16K (2K×8) static RAMS
- Ultra-low power (435 Ma. max. loaded with 64K)
- Bank Select and Extended Addressing
- A 2K window which can be placed anywhere in the 64K memory map
- Four independently addressable 16K blocks organized as:
 - Two independent 32K banks or
 - One 64K Extended Address Page or
 One 48K and one 16K bank for use in MP/M¹ (option)
- Each 32K bank responds
- independently to phantom
 2716 (5V) EPROMS may replace any or all of the RAM
- Field-proven operation in CROMEMCO CROMIX* and CDOS*.
- Compatible with latest IEEE 696 systems such as Northstar, CompuPro, Morrow, IMS, IMSAI front panel, Altair and many others.

OEM and DEALER inquiries invited.

Merchant Merchant

14666 Doolittle Drive San Leandro, CA 94577 (415) 483-1008

Circle 252 on Inquiry card

FULL TWO-YEAR WARRANTY.

The reliability of our boards, through quality-controlled production and proven performance, has enabled us to extend our warranty to a full two years. That's standard with us, not an option. This includes a 6-month exchange program for defective units.

Shipped direct from stock.

All Memory Merchant's boards are shipped direct from stock, normally within 48 hours of receipt of your order. Call us at (415) 483-1008 and we may be able to ship the same day.

16K RAM, Model



16K STATIC RAM \$169.

16K × 8 Bit Bank Select & Extended Addressing Four independently addressable 4K blocks

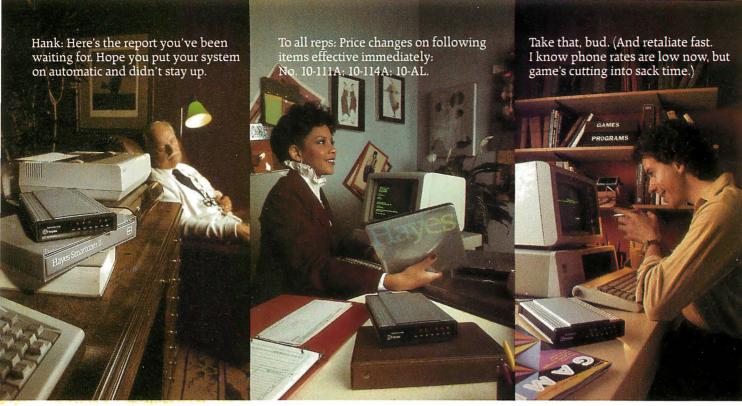
One 4K segment equipped with 1K windows

Uses field-proven 2114 (1 K × 4) RAMS Low Power (less than 1.2 Amps) Runs on any S-100 8080, 4 MHz Z-80 or 5 MHz 8085 system.

Prices, terms, specifications subject to change without notice.

*Cromix and CDOS are trademarks of CROMEMCO.

¹ MP/M is a trademark of Digital Research





Whether they're getting the jumpon the latest stock reports or waging galactic wars in the middle of the night, more and more personal computer users are communicating. With each other. With offices. With networks, utilities and mail services all over the country.

And Hayos is providing the computer

And Hayes is providing the communications link: A first-rate telecomputing system that combines an intelligent RS-232 connect modem with a sophisticated, easy-to-use communications program.

The Smartmodem 300. Think of it as your computer's telephone. Just plug it into any phone jack, and the Smartmodem 300 sends messages to and from

your personal computer, at 300 bits per second, over ordinary phone lines. Goodbye isolation. Hello world.

Your modem is the one peripheral that makes your computer a computer system. So it's only natural that you'd want the best modem for your money. (One that comes with a limited 2-year warranty.) The Smartmodem 300 is a wise choice. Far superior to acoustic coupler modems, which connect to the telephone receiver. And it's so easy to use.

It dials, answers and disconnects calls automatically, operating with rotary dials, Touch-Tone* and key-set systems. Plus it works at full or half duplex, which simply means that connecting to a time-sharing system, while it is a big deal, is no big deal to do.

Indicator lights let you see what your Smartmodem is doing, while an audio speaker lets you hear it. (Is the remote system down, or was the line just busy? This way, you'll know.)

Now all these extras aren't absolutely necessary. We could have gotten by without them. But at Hayes, we're not satisfied with just "getting by." That's why we made the Smartmodem 300 sowell, smart. You can even program it. In fact, we've provided one for you.

Announcing Smartcom II.™ The communications program designed by Hayes specifically for the Smartmodem. If ever there was friendly software, the Smartcom II is it!

The first time out, you'll be creating messages, sending them, printing them and storing them to disk. Simultaneously.

Likewise, when you're on the receiving end. Only you really don't need to be. With Smartcom II and your Smartmodem 300, your computer does it all, completely unattended! That's especially helpful if you're sending work from home to the office, or vice versa.

But it's justpart of the story. For instance, before you communicate with another system, you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once, the first time. After that, the information (called parameters) is stored in a directory on the Smartcom II. Calling or answering a system listed in the directory requires just a few quick keystrokes.

You can store lengthy log-on sequences

the same way.

Press one key, and the Smartcom II automatically exe-

cutes a whole string of numbers to connect you to a utility or information service.

And if you need it, there's always "help." Even while you're on-line, the screen will display explanations about a

prompt, message or parameter that will get you on your way in no time.

Śmartcom II also provides a directory of the files stored on your disk. You can create, display, list, name, re-name or erase any file right from the Smartcom II



And now Smartcom II is available for the IBM PC**and Xerox 820-II†.

Like all our products, Smartcom II and the Smartmodem 300 are backed by excellent documentation and full support from us to your dealer.

So see him today. Link up to the exciting world of telecomputing. Get a telephone for your computer.

Hayes Microcomputer Products, Inc. 5923 Peachtree Industrial Blvd., Norcross, Georgia 30092. 404/449-8791.

Smartcom II is a trademark of Hayes Microcomputer

Products. Inc.

'Trademark of American Telephone and Telegraph

'IBM is a registered trademark of International Business
Machines. Corp.

†Xerox 820-II is a trademark of Xerox Corporation ©1983 Hayes Microcomputer Products. Inc. Sold only in the U.S.A.

BYTE Interview

chronous as well as byte-sync and bitsync protocols. We felt that made a heck of a lot more sense for the customer as the world evolves toward X25-type packet transmission. We didn't want to make the customer buy an I/O card to upgrade from async to bit-sync. We have only three I/O slots, so we're careful not to waste them on things we can put in the main machine.

BYTE: Both serial ports can be bisynchronous?

Rosing: Yes; they can be programmed any way.

BYTE: And can this SIO function as a **UART?**

Rosing: Yes. A UART/USART combination.

BYTE: When did you know that you were going to have half a megabyte as standard memory? When did you know how much you were going to need?

Daniels: It's always been a backward sort of thing. We had the capability for a full megabyte in the machine, and it was more a case of how much memory we needed to achieve our

Tesler: The sales force wanted it to be 128K; the programmers wanted a megabyte. We negotiated.

Rosing: Since we were writing the code we got the megabyte.

Tesler: So the hardware people made it as big as they could in the address space, and then after some testing of the system we determined that half a megabyte was a reasonable compromise of cost and performance.

BYTE: Do you expect the standard memory on other manufacturers' machines to jump dramatically after the appearance of Lisa?

Tesler: Well, apart from its impact on cost, I don't think the amount of memory is a critical factor in deciding what machine you want to buy. If you're an end user, you should be buying a machine based on what it does for you, how easy it is for you to learn, how easy it is to use. Whether it has 12 bytes or it has 12 megabytes doesn't really matter to the end user, which is our marketplace. We're not selling the machine primarily to programmers who might care about that. End users have no idea which systems have more memory or less memory or one megabyte or one hundred thousand bytes. If other manufacturers are trying to match Apple, they should try to match us on ease of use and functionality and things like that. If they can do it in a small amount of memory, more power to them.

BYTE: Doesn't it matter when vou're doing something like dictionary software or when you want to read a dictionary into memory fast and proofread a document very fast?

Tesler: Yes, there are certain functions where it definitely makes a difference. We have that in our Lisa Calc. In order to do rapid recalculation, the whole matrix really should be in resident memory, so we spent a lot of time coming up with a data structure that packed that data as tight as possible so that it would get as many cells as possible into memory, no matter what size memory there was.

BYTE: Your version of BASIC will use more than 64K?

Daniels: Oh, yes. We could have put less memory in it, but the performance would have been unacceptable. Unfortunately, some companies advertise machines that have less memory than anyone would ever reasonably buy. We haven't tried to do that here.

BYTE: You didn't use less memory and fewer disk drives than would really be effective, and so on?

Daniels: Yes, and I think when you look at the typical configurations that people buy of other machines, the cost is really not that different from the kind of costs we're talking about for Lisa. If the other machines get loaded up with disks and memory and the other kinds of things you want to run, then their prices will be comparable.

BYTE: When you decided you had to have hard-copy graphic output that accurately represented the quality of the screen graphics, what choices did you consider before you did this amazing adaptation of a \$600-\$700



If you use a Word Processor, you need

GRAMMATİK™

Beyond Spelling Checking

Grammatik can find over 15 different kinds of common errors missed by simple spelling checkers alone, including punctuation and capitalization errors, overworked and wordy phrases, and many others. Use Grammatik with Aspen Software's spelling checker Proofreader, featuring the Random House Dictionary®, or with your current spelling checker for a complete document proofreading system.

Read what the experts say:

"The perfect complement to a spelling checker."

Alan Miller, Interface Age, 5/82

"A surprisingly fast and easy tool for analyzing writing style and punctuation."

Bob Louden, InfoWorld, 12/81

"Anyone involved with word processing in any way is encouraged to get this excellent program."

A.A. Wicks, Computronics, 6/82

"A dynamic tool for comprehensive editing beyond spelling corrections." Dona Z. Meilach, Interface Age, 5/82

"A worthy and useful addition to your word processing software."

Stephen Kimmel, Creative Computing, 6/82

Works with CP/M®, IBM-PC®, TRS-80®

Grammatik \$75.00 Proofreader \$50.00

Order directly from Aspen Software, or see your local dealer. Specify your computer system configuration when ordering! Visa, Mastercard accepted.

Random House is a registered trademark of Random House, Inc. Other registered trademarks: CP/M: Digital Research -- TRS-80: Tandy Corp. -- IBM: IBM -- Proofreader, Grammatik: Aspen Software Co.

Aspen Software Co.

P.O. Box 339-B Tijeras, NM 87059 (505) 281-1634



BYTE Interview

Rosing: A wide range of options were being discussed, all the way from thermal printers to laser printers. We tried to identify what's critical in the marketplace. We thought there were two printers of first priority: a personal printer and one with letter quality. At the same time our sister division, the Apple II-III division, was evaluating the same two sets of printers. So we teamed up and did a survey of virtually all the printers that were available from every manufacturer who would have the volume capability to serve our needs. We did an extensive test and put about eight dot-matrix printers through their paces with really tough software. Quite a few of them just fell right off the table - it was clear that the quality wasn't there. Certain vendors were also much more responsive to fixing problems. So it really boiled down to two printers. Then, as we developed our printer software, the one we're using now—the C. Itoh just far and away stood out as having the best mechanical design. You could put the dots where you wanted them repeatedly, and that's what we needed more than anything else in the world—good mechanical design.

Rosing: And a good price. Same for the letter-quality printer.

BYTE: The printer you are using is from C. Itoh, but it's your own ROM and your own systems software that drives the printer through the ROM. Rosing: Correct.

BYTE: What else can you tell us about the printer, especially the dot-matrix?

Daniels: Mechanically it's just a raster device.

Tesler: A character generator is built into it; it has some capabilities. It has a single type style that can be stretched horizontally and vertically as it's printed, and it has what they call a graphics mode. They thought that would be used lightly, but it's what we use almost exclusively. And even within the graphics mode, there are two resolutions, low and high. High resolution is a lot slower. We wanted to offer the user all these choices.

BYTE: So this is a custom design for you. . . custom changes?

Tesler: Custom changes I would say, ves.

BYTE: Did you say it sometimes prints out in character mode? I thought all of its printing when you were controlling it was using the highest resolution.

Daniels: I think all the stuff you saw was done at high resolution.

BYTE: For speed you can go to a different mode?

Tesler: Yes; we're planning to offer the customer a way to get a quick draft using the character generator. Characters won't look quite the way they will in the final version, but you can get output in a hurry.

Rosing: The printer will have three different speeds and three different quality levels.

BYTE: Do you have an idea where you're going next?

Rosing: We have what feels like ten years' worth of backlog. We have a pretty good idea what we're going to do for the next few years.

BYTE: What's that?

Rosing: The thrust is to expand the level of integration within the applications and to add facilities to make it easier for more applications to be written outside of Apple.

BYTE: Those facilities are the development toolkit?

Rosing: Yes. The development toolkit is a key thing. And for a large part of the marketplace, adding network applications and data communications is very important. Last but not least is adding really serious database functionality to the system. If you add all that up, it's as big a task or bigger than what we've just done.

Daniels: In fact, almost as important as the team building that we've gone through is building up this foundation that we've used to create the six applications we've now built. The foundation is an amazing application machine. We and others outside Apple can build applications that are just amazing now, because no one has to rebuild the foundation. It's already there, in place, and we really hope to leverage off that in the future.



FIRST FROM TECMAR

NEW REMOVABLE CARTRIDGE WINCHESTER

Write for new Tecmar Information Kit.

TECMAR

Personal Computer Products Division 23600 Mercantile Road Cleveland, Ohio 44122 Phone 216-464-7410/Telex 241735 This is the breakthrough in storage that IBM PC people have been waiting for, as Tecmar engineering keeps you moving ahead.

- the new SyQuest
 5 Megabyte removable cartridge Winchester disk drive
- complete, easily installed in IBM PC or available in IBM-compatible Tecmar expansion chassis
- new Tecmar superspeed controller
- Tecmar disk sharing for up to 4 IBM PCs
- your best solution for mass storage, and the most sensible back-up system available.

We believe this is the future in storage because we have proved its reliability and its advantages. The new removable cartridge gives you unlimited memory at a lower price tag than the basic Winchester at comparable speed.

\$1795 complete with controller & cartridge AVAILABLE NOW AT YOUR TECMAR DEALER



TECMAR COMPATIBILITY, VERSATILITY, RELIABILITY, AFFORDABILITY, RESPONDABILITY

The first and only complete line of fully compatible expansion options for IBM PCs, including every type of disk drive



NEW SHARED WINCHESTER PC-MATEIM

Our new GT subsystem upgrades our original with 3 times faster speed, sharing for up to 4 IBM PCs... Controller Board available for upgrade on trade-in.



PC-MATEIM FLOPPY

Controller Board will handle 51/4" and 8" disks. Winchesters can be installed in our floppy subsystem cabinet.

The new IBM Instruments Computer System:



Unique combination of features Unusual flexibility Attractive price

A new dimension in small computers.

In its price range, the new IBM Instruments Computer System offers higher levels of function and performance than other computers.

For scientific, engineering and general computing applications, including instrument control and data acquisition, data analysis and communications, no other computer is like it.

The IBM Instruments Computer System is based on the highest performance general purpose processor available. Modular design permits you to select a configuration to meet your present needs exactly. Provision for continuing enhancement and upgrading is built in.

The inside story

Basic working memory is exceptionally large. When expanded fully, the IBM **Instruments Computer System** has up to 5 megabytes of working memory.

You'll find more standard

communications ports and more connection modes than on other computers at or near the price. The optional integrated Analog I/O card further enhances connectability.

You'll also find a priority interrupt driven system with 32 levels of interrupt and 4 direct memory access channels.

The outside story

This is a computer that people find simple to understand and easy to use. Up to three interface modes (two programmable keypads and a keyboard) provide a wide range of choices for interacting with the system. Operation is from

menu or by simple direct command.

The system provides integrated high resolution graphics on a CRT. Hard copy is supplied by an optional high resolution 4-color printer/plotter using plain paper. These high levels of resolution are standard from IBM Instruments, extra on others.

Optional diskette and disk drives provide up to 44 megabytes of on-line storage.

A real-time, multitasking operating system and a wide range of programming support enhance the usability of the system.

The value story

The IBM Instruments Computer System can grow easily; you can add options yourself. Your initial investment is protected.

Starting at \$5,695, this system gives you outstanding power, capacity and performance for the money.

SPECIFICATIONS, IBM INSTRUMENTS COMPUTER SYSTEM

- Processor • 68000 8-MHz
- Working Memory
- Up to 128K bytes of
- ROM
- 128K bytes of RAM expandable in 256K increments up to 5 megabytes
- Disks and Diskettes
- Up to 4 Diskettes, 5¼"-322K bytes or 8"-1 megabyte each

*Trademark of Motorola, Inc.

Winchester type disks, 5 or 10 megabytes each

- Communications
- RS232C—3 ports • IEEE-488 bus
- Parallel I/O • VERSAbus*
- compatible system
- Analog I/O card Printer/Plotter
- 4-colors
- Up to 200 cps
- 200 x 336 dots/inch • Full dot pattern control for graphics plotting
- Display Screen
- 12" adjustable80 characters x 30

 Memory mapped Keyboard and Keypads

Full alphanumeric

• 768 x 480 dots

- keyboard plus 10 programmable keys Up to 57
- programmable soft keys on processor 10 programmable soft
- keys on CRT
- Programming BASIC/FORTRAN/
- PASCAL assemblers Utilities/Diagnostics Chromatography,
- FTIR and other application programs

We'd like to tell you more about it. Simply call 800-243-7054. In Connecticut, call 800-952-1073. IBM Instruments, Inc., Orchard Park, Box 332, Danbury, CT 06810.



The Enhanced VIC-20

Part 1: Adding a Reset Switch

Joel Swank 12550 SW Colony #3 Beaverton, OR 97005

Most microprocessor chips have an input pin called Reset. When an electrical zero or ground is applied to this pin, the microprocessor clears all internal registers and starts a preselected sequence of initialization instructions. That's how a microcomputer begins operation when you turn it on. Most microcomputers also have a Reset switch that enables the operator to apply the zero signal to the Reset pin to restart the computer. Unfortunately, the Commodore VIC-20 does not.

The VIC has a restore function that is activated by pressing the Stop/Run and Restore keys at the same time, but it doesn't use the 6502 microprocessor's Reset line. Instead, the Restore key is connected to a 6522 VIA (versatile interface adapter) that is programmed to interrupt the 6502 microprocessor each time you press the Restore key. The 6522 is connected to the 6502's NMI (nonmaskable interrupt) line. When the VIA interrupts the microprocessor, the program being executed stops and the VIC NMI interrupt-handling routine takes control. This routine checks to see if the Stop/Run key is depressed and, if it is, executes the warm-start routine. If the Stop/Run key is not depressed, the original program continues. In normal operation, this method of resetting the VIC works fine. When a program runs astray, you just press Stop/Run and Restore to recover. Any BASIC program in memory is preserved, and all parameters (screen color, sound, input/output devices, etc.) are reset to default values.

Editor's Note

The VIC-20 is one of the new breed of low-cost computers that offer a surprising amount of computing power for the money. But its low cost means that it lacks some of the features we've come to take for granted. In this series of articles, Joel Swank will "enhance" the VIC-20 and hence increase the utility of this very interesting computer. . . S.J.W.

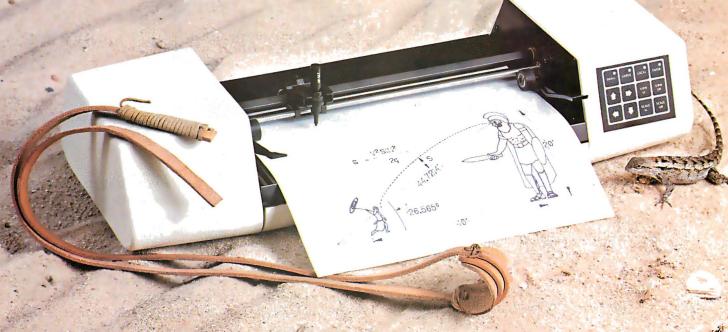
For the restore function to work, the VIA must be programmed properly. If the errant program has inserted random data into the VIA registers, the restore function will not work. There's another problem: the 6502 can enter a state in which the NMI has no effect. In this "hung" state, the 6502 performs no operations. You rarely encounter it when you use BASIC programs, but if you try to develop any machine-language subroutines, it could happen often. In both of the above cases the restore function does nothing. The only way to recover is to turn the VIC off and back on again, thereby erasing any data or programs that are in memory. A Reset switch can reinitialize the VIC without turning it off while preserving anything in memory.

Installing the Switch

You can implement a Reset switch for the VIC by adding two wires and a switch. Figure 1 shows the schematic diagram for the VIC Reset circuit. Normally, the 555 integrated circuit (IC) timer on the VIC board is used to generate a 3-second low pulse on the Reset line at power-up. The switch serves to temporarily connect pin 2 of the 555 (the trigger input) to the ground line. That causes the 555 to repeat the pulse, which completely resets the VIC system without losing the data in memory. (Note: making this modification to the VIC will invalidate your warranty, so you might want to wait until it has expired.)

The Reset circuit requires one normally open SPST (single-pole, single-throw) push-button switch and two 6-inch lengths of stranded insulated hookup wire. To install the circuit, you'll need a 25-watt or smaller soldering iron. Do not use a 150-watt soldering gun; it will destroy your VIC's printed-circuit (PC) board. Be sure to use only rosin core solder. You'll need a pair of wire cutter/strippers and a pair of small needle-nose pliers. To mount the

THEGIANTRULES



Vanquishes The High Cost Of Plotters

Small, smart and cost effective, the DMP-40 single-pen plotter puts bigplotter power at the command of the small-system user. With this amiable and competent aid at your side, you can create colorful 8½ x 11" and 11 x 17" graphics—images of professional quality for stand alone use, binding into reports or as overhead transparancies for group presentations.

Circles, arcs, ellipses and general curves are automatically generated by robust internal firmware, freeing you and your computer from wasteful low-level busywork.

By plotting in increments of only 0.005", you are assured of virtually step-free traces. The result is precisely defined graphics of high accuracy and solid repeatability.

Standard RS-232-C interfacing matches the DMP-40 to all current computers.

Multicolor plots on the DMP-40 are a simple matter since built in firmware and most commercial software provide 'pause' commands for pen changing.

These and more big-plotter capabilities are yours at small-plotter cost.*

For the name and location of your nearest distributor, call 512-835-0900 or 1-800-531-5205 outside Texas, or write Houston Instrument, 8500 Cameron Rd., Austin, Texas 78753. In Europe contact Bausch & Lomb NV. Rochesterlaan 6, 8240 Gistel, Belgium, Tel 059-27-74-45, Tlx 846-81399.

*US retail \$995.

BAUSCH & LOMB bouston instrument division

Create transportable software with...

MULTIUSER DATAFLEX

Get unmatched relational data base power and applications transportability with DataFlex. Applications created with DataFlex run on single and multiuser, 8 and 16 bit systems! What other data base lets you take advantage of:

CP/M	Action DPC/OS™
MSDOS	Molecular N-Star™
PCDOS	Novell Share/Net [™]
PC-Net	Televideo Mmmost™
CP/M-86	Corvus "PC" Network
MP/M-86	TurboDOS
OSM Zeus™	??? Network

Multi-user operating system implementations of DataFlex provide data protection to the field level in the data base, allowing multiple users to run the same on-line multi-file application.

All DataFlex versions provide on-line multi-key ISAM, powerful data entry and report generation, and a friendly menu to run your applications.

For more information contact your dealer or:

DATAACCESS®

4221 Ponce De Leon Blvd.

4221 Ponce De Leon Biva. Coral Gables, FL 33146 (305) 446-0669

CP/M & MP/M[®] Digital Research, MSDOS[®] Microsoft, PCDOS[®] IBM, TurboDOS[®] Software 2000.

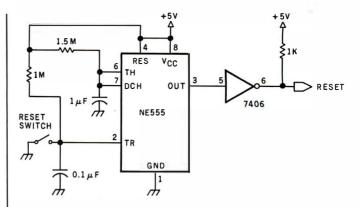


Figure 1: A circuit diagram for the Reset switch, which has been added between pins 1 and 2 of the 555 IC timer.

switch in the case, you'll need a V_4 -inch electric drill and drill bits. A small vise to hold the switch while soldering would be handy. You will also need a small Phillips screwdriver to disassemble the VIC.

First disconnect the power cord and any peripherals that are connected to the VIC. Then turn the VIC upside down and remove the three Phillips screws in the bottom front of the case. Turn the VIC back over and lift the top front of the case. It should separate from the bottom and hinge on some hooks at the rear of the case. You will see two sets of wires that connect the top and bottom of the case; these connect the main PC board in the bottom of the case to the keyboard in the top. The group of 18 wires on the left is for the keyboard. The wires must be disconnected at the connector on the PC board. Gently work loose this connector to reveal a row of square posts. The two wires on the right are for the power LED (lightemitting diode). They must also be disconnected from a connector on the PC board. When both sets of wires are disconnected, remove the top of the case and put it aside.

Let's take a look at the VIC board. Two versions are currently in use. The original version, made in Japan, was produced under an FCC waiver that allows it to emit substantial RFI (radio-frequency interference). A small printed notice over the game input/output (I/O) port states this waiver. The newer VICs, which are produced in the United States, have sufficient shielding to meet FCC regulations. Their PC boards are also arranged differently. I have one of the older models, so I'll approach it first.

On the older versions of the VIC, the right side of the PC board is almost completely taken up by the power supply and heat sink. On the far right are the connectors for the power cord and the game I/O. At the right rear is the housing for the expansion slot. The left side is taken up by the ICs that make up the VIC computer. The two 40-pin ICs in the left rear corner are the two 6522 VIAs that the VIC uses to communicate with external devices. Just in front of them are the two 24-pin ROMs (read-only memories), which contain the machine-language routines that make up the VIC control program and BASIC. In front of them is the 6502 microprocessor that controls the

QDP-300 The peace of mind computer.

Introducing our third generation computer... the all-new ODP-300. Now, you can rest assured you've found the most advanced microcomputer on the market today. The QDP-300 is a userfriendly system - its on-line "Help" system gives even untrained operators access to its full power. It uses CP/M* and MP/M* operating systems that assure the user of an abundance of compatible software. The QDP-300 even has a dual voltage system that allows worldwide operation (115 or 220 volts) at the flick of a switch. For word processing, financial forecasting, engineering design and manufacturing, inventory, payroll, bookkeeping and more, the QDP-300 will work hard for you for years and years to come. It's also comforting to know that the QDP-300 is fully expandable and readily upgradeable as your computer needs grow. There's even more. It might make you sleep better to know that the QDP-300 is backed by one year, onsite warranty with service provided by General

Electric Apparatus and Engineering Services, with more than 50 service locations nationwide. If these features and all of the others we've built into the QDP-300 don't bring you peace of mind, then the low price tag will.

- More Flexibility Easily upgradeable to 16 bit capability which gives the user 8 or 16 bit operation. IEEE 696/S-100 Bus.
- More Speed Unique "cache memory" disk operation makes the QDP-300 one of the fastest operational 8 bit systems on the market.
- More Power Advanced single board design utilizing Z80B** CPU operating at 6 MHz.
- More Storage Dual 8" floppy disk drives provide a total of 2.4 MB of formatted storage (10 MB and 15 MB internal hard disk system optional: 30 MB external hard disk system also available.)

Call or write for complete specifications and literature.



computer systems

10330 Brecksville Road, Cleveland, Ohio 44141 (216) 526-0838, Telex: 241596 Circle 356 on inquiry card Specifications subject to change

*CP/M and MP/M are trademarks of Digital Research Corp. **Z80B is a trademark of Zilog Corp.

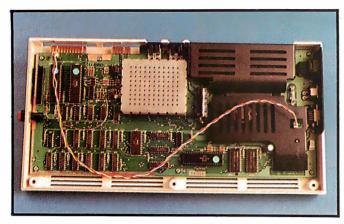


Photo 1: The VIC-20 circuit board. The Reset switch, shown at left, has already been installed in the American version. (Photos by John M. Hannan.)

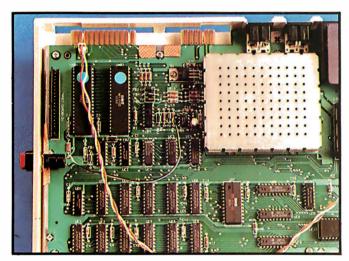


Photo 2: A close-up of the VIC-20 circuit board. The Reset switch is connected to pins 1 and 2 of the 555 IC timer next to the lower left-hand corner of the perforated metal box.

entire system. At the rear center is the 24-pin ROM that contains the VIC character-set patterns and the 40-pin 6560 video-interface chip (hence VIC) that controls the output to the TV. In front of the 6560 are the ten 2114 RAMs (random-access read/write memories) that make up the VIC's 5K-byte standard memory. The rest of the ICs on the board are the TTL (transistor-transistor logic) chips that perform the address decoding and interface between the larger ICs.

Photo 1 shows the newer version of the VIC, which has the power supply, expansion slot, and game I/O on the right side. It has additional metal shielding over the power supply as well. The ICs on the new version are rearranged. The 6502 microprocessor and the two program ROMs are located in the right front just below the power supply. The RAMs are located in the front left in two rows. The character-set ROM is just to the right of the RAMs. The 6522 VIAs are located in the left rear corner. The 6560 and the rest of the TV circuitry can be found in the center rear covered by a metal box. The 555 timer is

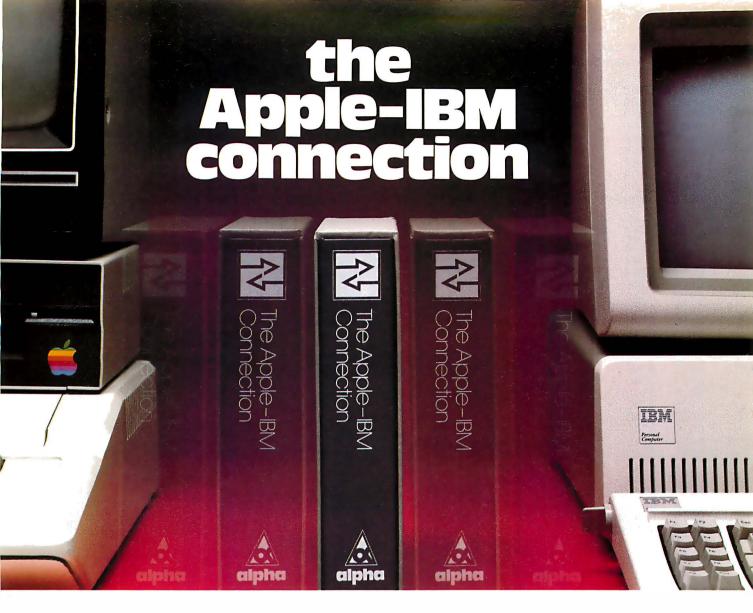
located at the left of this metal box.

You will install the Reset switch at the center of the far left end. To the left of the perforated metal box is the 555 timer (see photo 2). With only eight pins, it is the smallest IC on the board. Connecting the Reset switch involves soldering wires to pins 1 and 2 of this IC. The 555 has a dot beside pin 1. The pins are numbered counterclockwise from pin 1.

Before you make any connections, you must take the PC board out of its case. Remove the screws in the corners of the board, the two screws along the rear edge, and the screw along the front edge. The old version also has a black screw in the front center of the black-metal heat sink. Do not remove the two screws along the right edge. Once you've removed these seven or eight screws, the PC board should lift easily out of its case. If the area you're working in has any static electricity, make sure you discharge yourself by touching a metal object—a filing cabinet or table, say—before touching the PC board. Static electricity can destroy the delicate ICs on the VIC PC board.

Place the PC board on a flat surface to install the switch. Strip about ½ inch of insulation off each end of the two 6-inch lengths of wire. Twist together the strands of the four exposed ends and tin them by melting solder into the strands—that makes them easier to solder to the board and the switch. Next, solder one end of each wire to one of the connections on the switch. Solder the other end of one of the wires to pin 2 of the 555 IC. Solder the other wire to pin 1 of the 555. When you solder the wires to the pins, get the connections hot enough to melt the solder, but be careful not to get them too hot. Excess heat can damage parts and cause traces to lift from the board. The key is to work as fast as possible.

After you've made all the solder connections, you'll be ready to prepare the case for mounting the switch. You'll have to drill a hole through the left side of the case large enough to accommodate the neck of the switch. Because the VIC case is about 1/4 inch thick, you may have to countersink the hole (i.e., make it funnel-shaped) so that enough of the neck of the switch will fit through to fasten it. Locate the hole high enough from the bottom of the case so that the switch will not touch the PC board and close enough to the 555 so the wires will reach. Drill the proper size hole. If you need to countersink, use the point of a larger drill bit to partially increase the size of the hole from the inside of the case. After drilling the hole, make sure that the switch fits properly. Return the PC board to the case and reinstall the seven or eight screws that hold the PC board. Then insert the switch into its hole and fasten it securely. Reattach the two cables from the top half of the case. The cable on the left, for the keyboard, is keyed and will install in only one direction. The polarity of the LED cable on the right does not matter. Place the hooks in their slots at the rear of the case and gently close it. If the case is slightly warped, you may have to press down on the rear to get the hooks to engage properly. After you've closed the case, examine it on all sides to be sure that it has no gaps. Turn it over and reinstall the



Transfers any file back and forth!

Increase <u>VisiCalc</u> and <u>Wordstar</u> power by transferring files from the Apple II to the IBM Personal Computer—with no retyping and no errors!

CONNECT Apples to IBMs, Apples to Apples, or IBMs to IBMs. Transfer information from **any** file thousands of miles—in minutes.

UPGRADE your 64K Apple VisiCalc to 256K IBM VisiCalc power. Your worksheets can be larger.

INCREASE your Apple Wordstar 130K floppy capacity to IBM DOS Wordstar 320K floppy capacity. Over twice the space on disk.

CONTROL communication from either side in either direction with **Master/Slave** operation.

COMMUNICATE with people using the **Electronic Mail** mode. The Apple-IBM Connection can be used to send messages to Apples or IBMs.

Designed for the non-technical user, the Apple-IBM Connection comes with a disk for the Apple and a disk for the IBM. Connect the two computers with a cable or a telephone modem and insert the disks.

Turn on the computers and the software does all the work, asking you for the name of the file being transferred, the transfer speed, and the type of connection you are using.

Less than one minute after powering up, the transfer starts. The software checks to make sure that no errors occur during transmission.

Alpha Products for the IBM Personal Computer

All Alpha products come with **spoken instructions.**Alpha Software—professional, innovative, and easy to use.

Data Base Manager Type Faces

Question Mailing List

Call us for participating Computerlands and other dealers at (617) 229-2924.

REQUIREMENTS

Apple II—1 Disk, 64K Memory. D.C. Hayes Micromodem II or Mountain Hardware CPS Card. IBM P.C.—1 Disk, 96K (Compiled Version) or 64K (BASIC Version). Any RS-232 Card.

Circle 18 on inquiry card.



M Lankaniarage

₩ Type Faces

S' Queston

The Apple By

12 NEW ENGLAND EXECUTIVE PARK BURLINGTON, MASS. 01803

-0

\$195.00

Listing 1: The Reset program, which will reset the first link field and end-of-program pointers. Starting at line 25, use the POKE command to enter the program.

```
0000
0001
0002
         0000
                                        PROGRAM TO RESTORE THE BASIC END
0.003
         0000
0004
         00000
                                        OF PROGRAM POINTER.
0005
         00000
0006
                                        CALL WITH SYS 828
         0000
0007
         0000
8000
                                  CHAIN
                                            ≈$0533
         00000
                                                                      :VIC LINE LINK CALCULATOR
0009
         0000
0010
                                             *=$330
                                                                      ;ASSEMBLE IN TAPE BUFFER
         0000
         0330
033F
0340
0342
                  20
18
69
85
0011
                       33 C5
                                             JER
                                                  CHAIN
                                                                      ;FIND LAST LINK
0012
0013
0014
                       22
02
20
23
                                             ĽĎÄ $22
ADC #2
                                                                      : ADD
                                                                             TWO TO GET
                                             ADC #2
STA $2D
                                                                             ÓF PRÓGRÁM
                                                                      :END
                                                                      JAND SAUE IN END POINTER
JADD ZERO TO HI BYTE
0015
         0344
                  ŔŠ
                                             LDA $23
0016
         0346
                  69
85
                                             ADC
STA
         0348
                       00
                                                                      : IN CASE
0017
                                                  # 0
                                                                                   OF CARRY
         034A
0018
                       2E
                                                   $2E
                                                                      SAVE
                                                                               IT
0019
                                                                      RETURN TO VIC
         0340
0020
0021
0022
0023
0024
         034D
          0340
                                        POKE THE FOLLOWING DECIMAL VALUES STARTING AT 828 TO USE THE PROGRAM
                                                                                  VALUES INTO MEMORY
0025
0026
0027
         034D
034D
                                  : POKE
: POKE
: POKE
                                           828,32
829,51
830,197
0028
                                   : POKE
                                           831.24
0029
0030
0031
0032
0033
0034
                                           832, 165
833, 34
         034D
                                   : POKE
                                  POKE
                                           834,105
                                  : POKE
                                           835,2
                                   : POKE
                                           836,133
837,45
838,165
839,35
                                   POKE
                                   : POKE
0035
0038
0037
0038
0039
                                   : POKE
                                   POKE
                                  : POKE
: POKE
: POKE
                                           840,105
                                            841.0
                                           842,133
843,46
                                   POKE
0040
0041
0042
0043
                                   : POKE
                                           844,96
          034D
                                    ERRORS= 0000
0044
```

three screws in the bottom. You now have a Reset switch for your VIC.

Memory Pointers

You can use the Reset switch to recover when Stop/Run and Restore have no effect. Reset does not erase a BASIC program, but it does change two pointers in memory that VIC needs to find the program. One of the pointers that is altered is the link field in the first line of the BASIC program. Each line of a VIC BASIC program has a pointer to the next line. Reset clears the link in the first line so that the VIC thinks there are no statements in memory. Reset also changes the pointer to the end of the program. Both of these pointers must be restored to their proper values for the VIC to recognize the program that is in memory.

The easiest way to restore these values is to use the PEEK command to examine them *before* you run the program and then write them down in case you need to use

Reset. Then after you reset you can use the POKE command to restore them and execute the BASIC CLR command to reset the other BASIC pointers. Of course, chances are that when you have to use Reset you will not have thought to do this. It's possible to find the correct values for these pointers after the VIC has been reset.

On a standard VIC the first link field is located at memory locations 4097 and 4098 (1001 and 1002 hexadecimal). It is a 2-byte pointer to the beginning of the second line of the program. The end-of-program pointer is at locations 45 and 46 (2D and 2E). Finding the end of the program involves following the chain of BASIC statement links to the end of the program. Fortunately, there's a machine-language subroutine in the VIC ROM that will reset the first link and find the end of the program. To help in executing this subroutine I wrote the Reset program shown in listing 1. The program calls the VIC ROM subroutine that recalculates the VIC statement links and leaves the last pointer in a temporary memory area. It

FRANKLIN'S BAKER'S DOZEN!



13 Good Reasons to Buy the ACE1200

- 1. Apple® II-compatible
- 2. CP/M®-compatible
- 3. 128K of RAM
- 4. Built-in floppy disk drive
- 5. Disk controller
- 6. 80 column card
- 7. Serial interface
- 8. Parallel interface
- 9. Upper and lower case
- 10. VisiCalc® keys
- 11. Cursor control pad
- 12. Numeric pad
- 13. Auto repeat keys

Extras can more than double the price of your personal computer. Not so with the Franklin ACE 1200. It's the professional computer system that includes the extras—and a long list of exclusive Franklin features that make it the most extraordinary value on the market today.

The ACE 1200 has everything you'll need to add a color or black and white monitor, modem, printer, back-up disk drive and other accessories. You can choose from the enormous selection of Apple programs and peripherals because the ACE 1200 is hardware- and software-compatible with

the Apple II. And, with the built-in CP/M card, you can run both Apple II and CP/M programs. Franklin's CP/M operates three times as fast as many competing systems, drastically reducing processing time for most business applications.

The Franklin ACE 1200—the most extraordinary value on the market today. Call or write today for the name of your local authorized Franklin dealer.

Franklin ACE is a trademark of Franklin Computer Corporation. Apple is a registered trademark of Apple Computer Inc. CP/M is a registered trademark of Digital Research Inc. VisiCalc is a registered trademark of Visi Corp.

FRANKLIN

then increments this pointer by two and stores the result in locations 45 and 46 (2D and 2E). To use the Reset program, you must first enter it into an unused area of memory by using the POKE command. As shown in listing I, it resides in the VIC tape buffer at location 828 (33C), but it is relocatable and could be located in any spot you are sure will not be used. Use the POKE command to enter the decimal value given in the listing (starting at line 25) into memory beginning at location 828. Next enter a nonzero value into the higher-order byte location of the link field with the command POKE 4098.1. That lets the VIC ROM subroutine know that a program is in memory. Call the program with the BASIC SYS command SYS 828. Now initialize the rest of the BASIC pointers with a CLR command. The BASIC program is now fully restored and you can LIST it or SAVE it on tape.

Note that you must not use any BASIC variables during the above procedure. Doing so will wipe out part of the BASIC program. And if you're using an expanded VIC, the location of the first link field is different. If you have only a 3K-byte expansion board or a Commodore Super Expander plugged in, the higher-order byte of the link is located at 1026 (402). If you have one or more 8K-byte expansion modules, the higher-order byte of the link is at 4610 (1202). You can still use the above procedure to find the correct link value by substituting the appropriate address. If you have changed the pointer to the end of BASIC memory at locations 55 and 56 (37 and 38), Reset will restore it to the default value.

The VIC Reset switch is a handy addition to the VIC-20. It can save you hours of retyping a program. Using Reset instead of the on/off switch will also save wear and tear on your VIC.■





64K bytes of memory expandable to 256K, DMA, four serial ports, complete with BIOS for CP/M 2.2, and two 8-inch double-density disk drives. System has been assembled, tested, and burned-in

Singleboard CP/M system

AC-85 manufactured by Autocontrol: 8085 processor, runs at 10 MHz; 64K bytes of memory; disk controller performs DMA; CP/M bios in ROM; three serial ports, with individually software-selectable baud rates. Price includes: power supply, two 8-inch, double-sided, double-density disk drives, and CP/M 2.2....negot. 52400

Call or write
Jon Swanson
c/o BYTE, 70 Main Street
Peterborough, NH 03458
(603) 924-9281

Get Graphics On Your DEC* LA120

DECPLOT" upgrades your DEC LA120 to print graphics fast—only 35 seconds per average page...Just \$595. Need color too? Get DECOLOR"...Only \$995. Fully compatible with most graphics software and CRT display terminals.

NEW! VT-125 COLOR PRINTER INTERFACE \$495

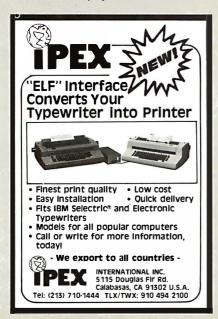
Texprint's simple plug-in modules require no extra custom software for dot-addressable or character-graphics applications. Expand LA120 performance, yet preserve all original functions. Available now from Texprint or DEC distributors.

*Registered trademark of Digital Equipment Corp.



*TEXPRINT, INC. 8 Blanchard Rd. Burlington, MA 01803 (617) 273-3384

Circle 413 on inquiry card.







• Atari 800 - \$539 • Atari 400 - \$229 CALL TOLL FREE

and Software items available.

OR WRITE
Computer Source International
Postal Division C
P.O. Box 213, Daleville, AL 36322

1-800-421-8978

BYTE's Bits

Public-Domain Apple Graphics Routines

One reason for the Apple II's popularity is the large amount of public-domain software available for it. Most public-domain software is rather modest stuff, but someone occasionally donates an impressive piece of software that is easily good enough to be sold commercially. Such a piece of software (obviously a labor of love that reflects much work and talent) is David Shapiro's Dr. Cat's Grafix Disk. This is an Apple II floppy disk running under the DOS 3.3 operating system that gives the user a 5K-byte package of high-resolution Apple graphics routines, the source code for the assembly-language routines (in Apple DOS Tool Kit format), some documentation, and a lot of enjoyable demonstration programs.

David sees Cat-Grafix, as he calls them, as an alternative to the high-resolution drawing routines provided by Applesoft. The package has 25 major routines, each of which can be called from BASIC or entered via an optional set of ampersand routines (e.g., &HIRES). The routines include both color and black-and-white versions of subroutines that plot points, draw lines, outline or fill boxes and circles, scroll the high-resolution screen, and draw characters from a user-defined character set onto the high-resolution screen.

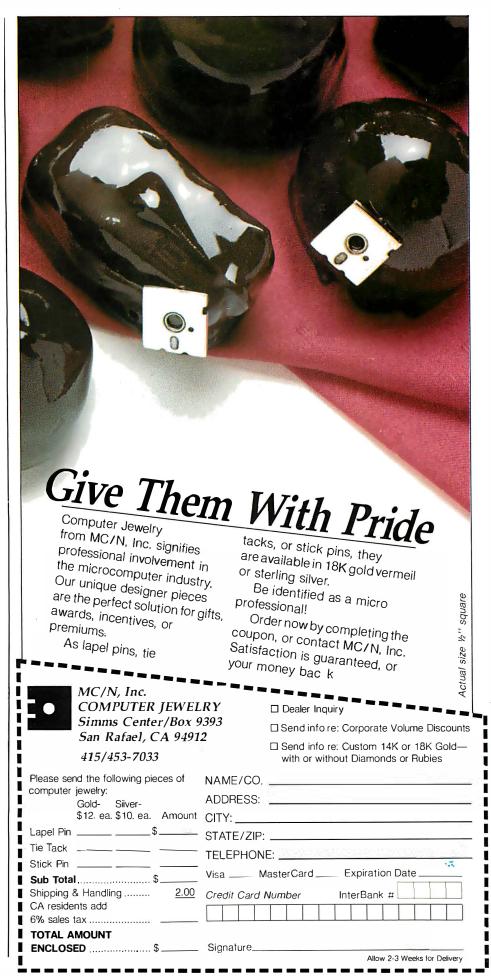
The disk and associated software are in the public domain and can be used as part of another program (commercial or otherwise) if credit is given to Cat-Grafix. The disk is currently being distributed through Apple user groups and can be copied without limitation. If you cannot get this disk through these channels, it can be ordered from:

David Shapiro Pepperland Software POB 5158 Bloomington, IN 47401

Please send an Apple disk, a check for \$8, and a stamped, self-addressed return envelope with sufficient postage and cardboard protection for the disk.

I think that Cat-Grafix is one of the most impressive sets of graphics routines for the Apple that I have ever seen, and the price is certainly right. David is to be commended for his decision to give this software away. I hope that his efforts will persuade other hobbyists to share their work.

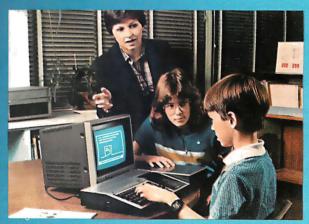
Gregg Williams Senior Editor■



PLATO WIDENS YOUR CHILD'S WORLD.

Announcing new educational courseware for microcomputers to improve your child's Basic Skills, High School Skills or Foreign Language vocabulary.





NOW. PLATO Basic Skills. NOW. PLATO High School Skills. Both for use with TI 99/4A.*

Control Data and Texas Instruments are working together to make this nationally recognized PLATO courseware available via microcomputers.

Control Data's PLATO Basic Skills is a comprehensive curriculum designed to enhance the development of elementary and junior high Reading, Math and Grammar skills.

Control Data's PLATO High School Skills help high school level students master Reading, English, Math, Social Studies and Science. It has been used to assist students preparing for G.E.D. exams.

*For Basic and High School Skills pricing and order information, write: Texas Instruments, Education Department, Box 53, Lubbock, TX 79408.

NEW!* Nine lessons in Foreign Languages for use with Apple II Plus.

Three lessons each for French, Spanish and German. Each lesson uses a hangman or pyramid game to help children learn words most associated with defined activities. For junior or senior high students.

Travel Words: Children study French, Spanish or German words they need to know to buy train, plane or bus tickets; order in a restaurant; request medical assistance; read street signs; etc.

Shopping Words: Children study French, Spanish or German words they need to know to shop for food, clothing, etc.

Classroom Words: Children study the French, Spanish or

German words that are common to the school environment.

*Available March 30

Lessons Available For Apple II Plus, TI 99/4A and Atari 800.

Basic Number Facts: Practice in addition without carrying; subtraction without borrowing; and multiplication/division with single digits. For elementary students.

Whole Numbers: Practice in addition, subtraction, multiplication, division and mixed numbers. For elementary and junior high students.

Decimals: Practice locating decimal numbers on the number line. For elementary students.

Fractions: Same skill level and format as decimals.

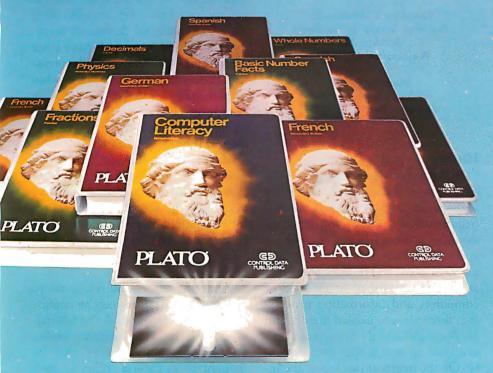
Physics—Elementary
Mechanics: Students are
shown a physical problem, then
must "purchase" the missing
information to answer it
correctly. For senior high
physics students.

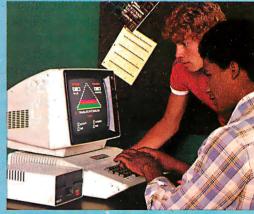
French, German, Spanish Vocabulary Builders: Gives children a basic vocabulary of 500 words. Supplements introductory and refresher courses.

Computer Literacy—Introduction: For jr. or sr. high and vocational school students.

INTRODUCTORY OFFERING:

- Single lesson, \$45.00
- Additional lessons, \$35.00 ea.
- Additional disk included with each lesson ordered at no extra charge
- 10 day money-back trial





SEND FOR PLATO COURSEWARE CATALOG

For a free copy of our PLATO catalog, or to order, mail reply card, call toll-free 800/233-3784, or write Control Data Publishing Co., P.O. Box 261127, San Diego, CA 92126. In California, call 800/233-3785.

Circle 121 on inquiry card.

CONTROL DATA
PUBLISHING

PLATO®
COMPUTER-BASED EDUCATION

The World of Standards

The process for producing standards is full of checks and balances.

As our civilization grows more complex, the need for standards increases at an amazing rate. Without thinking in terms of standards, we are accustomed to asking for a specific weight of oil for our car, film of varying speeds for our cameras, tires of a certain size, and certain kinds of electric light bulbs, electric sockets, extension cords, etc. Standards are vital to our daily lives. As consumers, we have become dependent upon standards and would not tolerate the inconvenience incurred by a lack of standards.

Standards are such an integral part of our daily lives that we are often oblivious to their existence and therefore do not always appreciate their value. As we understand the role played by standards in our daily lives, it becomes easier to understand why a need for standards arises. When this need in a particular area becomes acute, the next logical step is to convene a committee interested in the subject to develop a standard.

Standards organizations exist to provide a framework so that standards that represent a consensus can be developed and approved.

Much of this material has been adapted from The World of EDP Standards, 3rd edition, by R. D. Prigge, M. F. Hill, and J. L. Walkowicz. (Blue Bell, PA: Sperry Univac Corporation, 1978). Used by arrangement with Sperry Univac.

Chuck Card 2192 Buckboard Circle Warrington, PA 18976

R. Donald Prigge 418 Sassanqua Dr. Georgetown, SC 29440

Josephine L. Walkowicz National Bureau of Standards Building 225 Washington, DC 20234

Marjorie F. Hill 34 South Lanvale Ave. Daytona Beach, FL 32014

History

In the early part of our century, the general need for standards was fairly widespread, and as a result, several organizations were founded to develop standards in a variety of areas. Therefore, when the first suggestions were made that standards should be established in the field of computers and information processing, there already existed mature and well-established organizations available to accept that responsibility. On the international scene, the International Organization for Standardization (ISO) authorized the formation of Technical Committee 97 (Computers and Information Processing) and Technical Committee 95 (Office Machines). These two committees have now merged into Technical Committee 97 (Information Processing Systems). In the United States, the American National Standards Institute (ANSI) assigned to the Business Equipment Manufacturers Association (now the Computer and Business Equipment Manufacturers Association, or CBEMA) the responsibility for forming the corresponding American National Standards Committees X3 and X4, which have since merged into Committee X3 (Information Processing Systems). X3 now has responsibility for all of ANSI's computer-related standards (see figure 1 for a chart of the X3 organization).

Meanwhile in Europe, the European Computer Manufacturers Association (ECMA) was formed, and by mid-1961, the standardization effort for computers and information processing was well underway.

Objectives

While the names and relationships of these organizations can be confusing, the objectives of all the international and national standards bodies are so similar that they can be thought of as carbon copies of each other. Basically these objectives are development, promulgation, and establishment of standards; coordination of standards development; and exchange of information.

At the technical level the objective is the development of a standard for a specific product or process.

Here's what your IBM Personal Computer can do with Edix + Wordix (for only \$390.00!)

Emboldening - Multi-line S. F. Kraft June, 1982 Pollution and Health American Health Conference headers and Air Pollution life combined with human-made was constitutes another hazard to health. footers Natural processes such as forest fires and volcanic eruptions, or burning otties are fire during war, have long contastnated the air. See and the by-products of ocal burning have long been ecognized as irritating disturbances plagfirms unvaries and clouding the skies. Right -6.1 Types of Water Pollution Traditional waste uses up oxygen supply needed by aquatic plant and animal life. When bacteria in the water can not decompose the waste, widespread aquatic death results.** justification **Automatic section** Air and yeter pollution act inven-changeably; all people on the earth share the oceans Mid the air. Sig-militant local pollution of either can greatly affect dietant ageas, espe-cially if the oceans cannot by the processes of precipitation, oxidation, and absorption cleanse the atmosphere. Effects include impaired occumination, irritability, depression, fatigue, and tension. 6.1.1 Organisms. There pollute water when sewage cagnying these bacteria enter a river on stream. These microbes may opened inflectious hepaticis or typhoid fever, especially in rural and condity is high and public utilities listed. of contents Underlining • 6.1.2 Nutrients. These elements that mourish plant life, particularly phosphates and nitrates, are produced by swags, industrial wastes, and soil erosion. They are not removed by tradement centers and may inadvertently be **Automatic** Types of Air Contaminants There are three major types of airborne Combustants Additional liberation of carbon monoxide, sulfur oxides, and nitrogen oxides into the air. Labeled and 6.1.3 Synthetic Chemicals. Detergents and posticides affect water. There may be a possibility of human polsoning gwar time, Absorption generally follows this ferenta: automatically A noxious mixture of fog and smoke. Subscripts, numbered lists Minute particles such as dust, digt; smoke, and fly ash. These may soif sur-faces, distribute light rays unevenly, and enter lungs. superscripts, and $h_p = G_{ij}^2 + Mn_{ij}^{b+2}$ overstrikes where A, G and Mn are as defined in Section 3. 6. Water Pollution 6.1.4 Inorganics. Minera s from min-Automatic page and Pollution of water from the natural processes of aquatic animal and plant those parasitic manifestations discussed earlier. In any event, the effects concerned with water pollution are dominant. section numbers in **Automatic** * These processes are essentially due to those effects; as well as due to ** See Section 8. headers and footers Page 37 Session IX It takes just a toll-free phone call

EDIX + WORDIX gives you maximum flexibility for creating your documents. Its unique multiple-window screen opens newhorizons to your creativity. And EDIX is so easy to use most of our customers claim they never have to read the User's Manualt

Not only can EDIX + WORDIX do everything we've shown, but it can drive any printer, and access special symbols, too. These and other features make EDIX + WORDIX the World's Finest Microcomputer Word Processor!



2031 Broadway Boulder, Colorado 80302 303 447-9495

For more information or to place an order, call toll-free 800-782-4896







or see EDIX + WORDIX at ComputerLand® and other fine computer stores

Dealer inquiries welcome

numbering and table

hyphenation

footnote placement

to join the growing group of sat-

isfied EDIX+WORDIX users.

Why not pick up your phone

right now?

Requires 128K IBM PC with DOS. EDIX demo available for \$15.

TM Trademark of Emerging Technology Consultants, Inc.

Membership and Finance

The membership base of standardsmaking bodies varies somewhat, but in general, at the international level, the members represent nations. At the national level, individual members represent interests of consumers, producers, and general-interest groups.

Membership in standards organizations is restricted in the sense that each organization establishes categories and balance for membership but is open-ended in respect to the number of members. In the ISO. membership is restricted to the standards organization most representative of each nation. ANSI represents the United States in ISO. and therefore, no other standards organization based in the United States can hold membership. (Other standards organizations are subtly restrictive on the basis of technical interest, product produced, or similar categories.)

Although many international and national organizations derive their operating revenue from membership dues and the sale of standards, others are wholly or partially supported by their governments. Several national standards organizations have extended their activities to include a certification program, which contributes to their income. Most of the organizations important to computer stan-

132

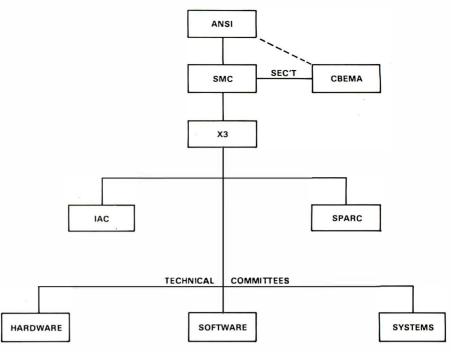


Figure 1: Structure of the American National Standards Committee X3 for Information Processing Systems. The abbreviations stand for the following: ANSI, American National Standards Institute; SMC, Standards Management Committee; CBEMA, Computer and Business Equipment Manufacturers Association (the secretariat to X3); IAC, International Advisory Council; and SPARC, Standards Planning and Requirements Committee.

dards are self-sustaining nonprofit organizations.

Technical Committees

Within a standardization organization, technical committees are chartered to develop standards in an assigned range of interest. Because this charter generally covers a broad technical area, a technical committee may work simultaneously on several overlapping or independent technical areas within its assigned responsibility. A technical committee may also need to establish liaisons with technical committees of other standards organizations or within the same parent organization.

Most technical committees have an



computers wholesale

315-472-3055 Box 91 Brewerton, N.Y. 13029

Circle 112 on Inquiry card.

We pay UPS shipping charges on prepaid orders.

	-SYSTEMS-	l
	ALTOS	1 H E E E E E E E E E E E E E E E E E E
	ATARI 800 (48K) \$659 400 (16K) 259 810 Disk Drive 449 850 Interface 169	
The state of the s	CROMEMCO CS-0 \$1035 CS-1 3195 CS-1H 5595 CS-2 3755 CS-3 5595 ZPU 315 64KZ 585 TuArt 249 16FDC 475 The complete CROMEMCO line is available.	
	INTERTEC Superbrain II Jr	
	MORROW DESIGN Decision I \$1335 Micro Decision w/Terminal 1 Drive Call 2 Drives Call Discus 2D 830 Dual Discus 2D 1385	
	Call us for prices on the full MORROW line. NORTHSTAR Advantage \$2895 Horizon 20-64K 2655 HD 18 Mg. Disk 3879 G CP/M® for Advantage 119 We carry the complete NorthStar line – Call!	1
	TELEVIDEO TS-801 \$2650 802 2755 802H 4755	
	ZENITH 2-89-80 CP/M® or H/DOS \$2075 2-89-82 CP/M® or H/DOS 2115 Z-90-80 CP/M® or H/DOS 2115 Z-90-82 CP/M® or H/DOS 2299	ı
	Advertised prices reflect a cash discount on prepaid orders only. Most items are in stock for immediate delivery in factory sealed cart ons with full factory warrantees.	

-TERMINALS-	I
ADDS Viewpoint\$529	
HAZELTINE Esprit	
INTERTEC Intertube III	۱
SOROC. Call! TELEVIDEO 910. \$559 912. 659 920. 719 925. 719 950. 899 X-tra Page Memory 80	
WYSE-100	I
ZENITH 2-19	I
-PRINTERS-	I
ANADEX DP9500\$1290 2K Buffer80 95011290 96201475	
CENTRONICS 704-9 Ser. \$1519 704-11 Par. 1569 730-1 Ser. Savel 299 730-3 Ser. 479 737-1 Par. 689 C.ITOH	
Prowriter 8510 A Par. \$425 Prowriter 8510 A Ser. 595 Starwriter F10 Par. 1370 Starwriter F10 Ser. 1370 Printmaster F10 Par. 1785 Printmaster F10 Ser. 1785 C.ITOH Starwriter F10-Tractor, 200 Prowriter II Call	
DIABLO 620 RO 25CPS \$1275 630 RO 40CPS 1949 Tractor. 275	
EPSON MX-80. \$440 MX-80FT 520 MX-100 715	

Serial RS232 w/2K 120

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
NTEGRAL DATA SYSTEMS Prism 80 Basic. \$750 Prism 132 Basic. 1075 Prism 80 Package. 1299 Prism 132 Package. 1465 Prism 80 All but color. 1065 Prism 80 All but color. 1260 Paper Tiger 445G. 599 Micro Prism. 639
NEC 1510. \$1515 1515. 1540 15530. 1650 17710. 2295 17715. 2395 1023. 465 OKIDATA
\$30. \$300 \$2A. 395 \$3A. 639 \$4S. 989 \$4P. 989 Fractor for 80/82A. 50 SMITH-CORONA TP-1. Call
TI-810 Basic \$1289 TI-810 VCO/Full 1549 TI-820 RO Basic 1545 TI-820 KSR Package 1739 —MONITORS—
AMDEK 100G. 141 Color I 310 Color II. 649 Color III 419 300G. 149
BMC Green Phos\$99
SANYO \$159 9"Green Phos
ZENITH Z-121115
-HARD DISKS-
CORVUS 5MB. \$2555 10MB. 3995 20MB. 4795 *Please specify what type of computer used Mirror Backup. 629
MAEZON 5Mg\$2235 10 Mg2760 15 Mg3020

HAYES Micro Modem 100 279 Micro Modem II 279 Smartmodem 300 215 Smartmodem 1200 520 Chronograph 199
NOVATION 4102D 300/1200 \$269 D-Cat 145 Apple Cat II 310 Nov-212 1200 Baud 549
-SOFTWARE-
ASHTON-TATE
D Base II
COMPU-View
V-Edit
MICROAP
Select III
Selector IV
Selector V
Glector245
CP/M"2.X
Expand
MICROPRO
Supersort I
Supersort II
WordStar 295
Mailmerge
DataStar
CalcStar
MICROSOFT
Z-80 Soft Card
Edit8085
Macro 80
Basic 80
Bascom
Fortran 80
Softcard Premimum Pack. 625
MICRO TECH CALL
OSBORNE
Business Pack
General Ledger
Payroll, Cost Accounting 59
Accs. Payable /Accs. Receivable 59
SORCIM Supercalc225
BLANK DISKS—Call for prices
-MEMOREX, MAXELL,
SCOTCH, VERBATIM—

-MODEMS-

you require. N.Y. residents, add appropriate sales tax. Shipping is not included (unless otherwise stated) C.O.D.s require a 25% deposit. All

If you can't find what you need listed here, just call for the best prices on the items

prices and offers may be changed or with-drawn without notice.

ISO/TC 97 MEMBER COUNTRIES

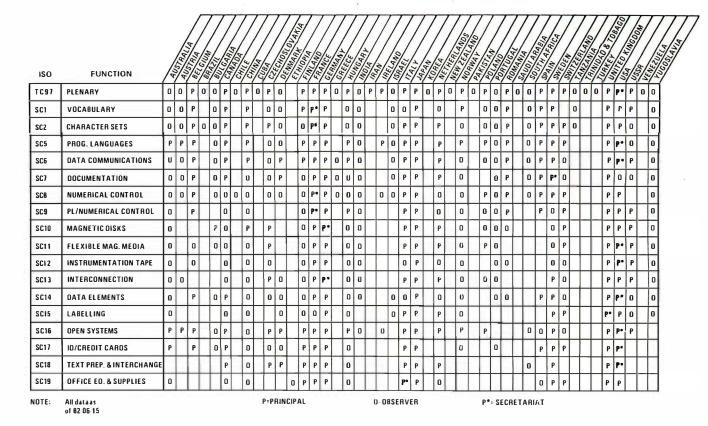


Figure 2: The ISO/TC 97 is the technical committee for information systems. The member countries belong to one or more of the various standards committees (SC) under the technical committee. Each member country has the option of participating in a principal or an observer role. Additionally, some members may serve as secretariat of a standards committee.

organizational structure similar to that of the parent organization and have a quota of administrative and advisory groups to supervise the progress of the technical work.

Most of the developed countries take an active part in the development of standards. Some elect to monitor the international development work, which is then evaluated in terms of their national requirements. Australia and Denmark are examples of this type of participation. It is also common practice for some national organizations to adopt the International Standards developed by the ISO Technical Committees (see figure 2 for a list of the member countries in ISO Technical Committee 97).

Development of a Standard

Standards development is based upon cooperation and consensus of the parties involved regarding technical content. This may require many changes in wording to effect a compromise, as well as many material additions or deletions. The ultimate objective is to produce a standard for which consensus can be achieved.

The philosophy of consensus imposes a responsibility upon the organizations within which standards can be initiated, developed, and approved: the organizations must develop a process, methods, and operating procedures that will guarantee that a consensus has been reached.

In the United States, ANSI recognizes only three methods for the development of evidence of consensus for approval of American National Standards: the Accredited-Organization Method, the Canvass Method, and the Standards-Committee Method. All methods have the same objective, i.e., to develop evidence of consensus of interested parties for approval of a proposed standard. Any individual or any organization may propose a standard for approval and, in so doing, may specify any one of the three methods.

Accredited-Organization Method

Any organization involved in standards work may seek accreditation from ANSI. As an accredited organization, it may submit proposed American National Standards to ANSI for approval.

To be accredited, an organization must have a procedure for development of consensus comparable to that required under the Standards Committee Method.

When the proposed standard has's been approved within the accredited organization, it is sent to ANSI for approval as an American National Standard.

Canvass Method

When a standards-making organization or any other responsible organization has existing or draft standards it wants to have considered



High Resolution RGB Color Monitor Designed for the IBM Personal Computer

FEATURES

- ☐ 80 characters x 25 lines
- ☐ 690 dots horizontal resolution
- ☐ 16 colors
- ☐ .31 mm dot pitch tube
- □ non-glare, black matrix
- □ plugs directly to IBM PC

\$795



Princeton Graphic Systems' new HX-12 high resolution color monitor is designed with an NEC .31 mm dot pitch CRT to give you up to 690 dots horizontal resolution. You need not compromise the display quality of your system with monitors rated at less than the 640 horizontal dots generated by your IBM PC. The PGS HX-12 delivers 16 supercolors, 80 characters x 25 lines. It is the best priced performance PC direct drive monitor in the market today. Get the PGS HX-12 and discover for yourself how well it complements your IBM Personal Computer.



Princeton
Graphic Systems

he Choice of

Computer Exchange — The Supply Center for the IBM-PC

SOFTWARE for the IBM-PC

BUSINESS		
BUSINESS		7,117
	PRICE	PRICE
	\$ 700	\$419
ASHTON-TATE, dBase II, requires CP/M-86 & 128K	\$ 700	\$449
dBase II, requires PC-DOS & 128K APPLIED SOFTWARE TECHNOLOGY, Versaform NEW!	\$ 389	\$265
DATAMOST, Real Estate Investment Program NEW!	\$ 130	\$ 89
Write-On	\$ 130	\$ 89
DENVER SOFTWARE, Easy (Executive Accounting System)	\$ 750	\$545
EAGLE SOFTWARE, Money Decisions NEW!	\$ 150	\$129
HOWARDSOFT, Real Estate Analyzer	\$ 250	\$189
INFORMATION UNLIMITED, Easywriter II (a WFS)	\$ 350	\$259
Easyspeller (88K Words)	\$ 175	\$129
Easyfiter (a DBMS)	\$ 400	\$299
Easy Planner	\$ 250	\$189
INNOVATIVE SOFTWARE, T I M III (a DBMS)	\$ 495	\$369
* INSOFT, Data Design (a powerful easy to use DBMS) NEW!	\$ 225	\$169
ISA, Spell Guard	\$ 295	\$220
ISM, MatheMagic	\$ 90	\$ 69
Graphmagic NEW!	\$ 90	\$ 65
Math/Graphmagic Combo NEW!	\$ 160	\$109
LEXISOFT, Spellbinder (a versatile WPS in CP/M-86)	\$ 495	\$249
MICROCRAFT, Requires CP/M-86 & CBASIC-86	. 300	+205
Legal Billing & Time Billkeeping Professional Billing & Time Keeping — Billkeeper	\$ 750 \$ 750	\$395 \$395
► MICRO LAB, The Tax Manager	\$ 250	\$189
MICROPRO, WordStar® plus free WordStar Training Manual		\$249
MailMerget M.	\$ 250	\$ 79
SpellStar ^{T M}	\$ 250	\$129
3 Pak. Word & Mail & Spell, above 3	\$ 845	\$445
MICROSOFT, FLight Simulator (by Sub-Logic) NEW!	\$ 50	\$ 35
NORELL. Visualize	\$ 100	\$ 75
Easy Data DBMS	\$ 250	\$189
NORTH AMERICAN BUS, SYSTEM, The Answer	\$ 250	\$169
PBL CORPORATION, Personal Investor NEW!	\$ 145	\$ 99
*PEACHTREE. Peach Pak 4 (GL, AR & AP)	\$ 595	\$395
PERFECT SOFTWARE, Perfect Writer 1 M	\$ 389	\$239
Perfect Speller M	\$ 189	\$119
Perfect Filer T.M	\$ 289	\$179
SELECT INFO. Select (a WPS)	\$ 595.	\$339
SORCIM/ISA, SuperCalc	\$ 295	\$199
SuperWriter	\$ 395	\$269
SYNERGISTIC, Data Reporter NEW!	\$ 250	\$169
¥ VISICORP, VisiCalc®/256K	\$ 250	\$179
VisiDex or VisiSchedule, each	\$ 250	\$199
VisiTrend/Plot	\$ 300	\$219
VisiFile or Desktop Plan I, each	\$ 300	\$239
Queigens Engageting Model NEWI	. 100	e 75

UTILITY

Business Forecasting Model

CENTRAL POINT, Copy II PC, bit copier & utilities NEW! \$	40 :	\$ 35
	35	\$ 29
NORELL DATA, System Backup, Bit Copier \$	50	\$ 39
	80 :	\$ 65

HOME & EDUCATIONAL

	2	30	\$ 21
	Š		\$ 29
NEW!	Š		\$ 75
	2		\$ 22
	•		\$112
	•		\$ 22
	3		\$ 22
	S		\$ 55
			\$ 39
			\$ 29
NEW			\$ 19
	•		\$ 25
			\$ 99
NEW			\$ 25
			\$ 23
	(B) (S)		\$ 35
	?		\$ 25
	1	40	\$ 30
	NEW!	NEW!	\$ 30 \$ 150 \$ 30 \$ 30 \$ 75 \$ 50 \$ 40 NEW! \$ 25 \$ 145 NEW! \$ 35 \$ 30 \$ 45 \$ 35

DISKETTES

DIVILLE				
Control Data Corporation 12 for 10 Special.	Lin	nited	Tim	ıe!
CDC, 120 each, 514 with ring, SS, SO (Apple, IBM, etc.)	\$	450	\$	195
12 each, 514, with ring, SS, DO (Apple, IBM, etc.)	\$	40	\$	22
12 each, 514 with ring, SS, SD (H/P, IBM 320K, etc.)	\$	51	\$	28
12 each 8", SS, SO	\$	51	\$	28
10 each, 514 with ring, DS, DO (IBM)	\$	50	2	39
IBM, 10 each, 51/4, SS, SD (Apple, IBM, etc.)	Š	60	\$	45
10 each, 514, SS, DO (H/P, IBM 320K, etc.)	\$	65	\$	49
VERBATIM, 10 each 514, with ring, SS, SD or SS, DD	\$	50	\$	28
MAXELL, 10 each, 5¼, SS, SD	\$	55	\$	35
OYSAN, 10 each, 514, SS, SD	S	55	\$	39
10 each, 5, DS, DO	\$	65	\$	49

★ Means a BEST buy.

AD #959

Hot Line For Information On Your Order (503) 772-3803



64K IBM-PC IBM is a trademark of IBM Corporation. \$2850

Two Disk Drives 12" Green Monitor Monitor Not As Shown 90 Day Warranty Call For Details And

Other Configurations



HARDWARE for the IBM-PC

	PRICE	PRICE
MEMORY CHIP KITS, 64K addon to your memory cards tested and burned in, 90 day warranty	s. 9 chips, \$ 150	200NS, \$ 69
Combo Plus. 64K with async, port. Combo Plus. 64K w/async. & para Combo Plus. 64K w/async. & para Combo Plus. 64K w/async. para & clock/cal For above Combo Plus of 128K add \$85.for 256K add \$256.		\$359 \$359 \$395 \$429 \$192, for

BUY VALUE of the YEAR:

64K RAM Card, 1192K When Tully			
COMEX +2 year warranty	\$ 3	395	\$149
192K RAM Card + 2 year warranty	\$ 6	575	\$249
CURTIS. PC Pedestal, M for Display on PC	2	80	\$ 65
9 Foot Cable for IBM Keyboard (extends 3' to 9')	\$	50	\$ 45
DAVONG DSI 501 Hard Disk, 5 Meg			
DSI 501 Hard Disk, 5 Meg	\$15	995	\$1495
MAYNARD, Floppy Drive Control Board	\$	195	\$165
A 410000FT 64K RAM Card w/Parity	\$	350	\$259
MICROSOFT 64K RAM Card w/Parity	\$ 5	525	\$395
256K RAM Card w/Parity	\$ 1	875	\$659
64K RAM Chips T.M.		175	\$129
Tecmar Inc. ALLINONE Board, 64K			
ICCIII AI IIIC. ALLINONE Board, 64K	\$:	565	\$415
128K	\$	735	\$535
256K	\$:	975	\$675
S QUADRAM CORPORATION			
CORPORATION:			
O W LOOK IN THE STORY ALL ST. A. C.	100	FOE	***

TO CORPORATION		
Quadboard, 64K, expandable to 256K, 4 function board	\$ 595	\$43
Quadboard, 128K, expandable to 256K, 4 function board	\$ 775	\$56
Ouadboard, 192K, expandable to 256K, 4 function board	\$ 895	\$63
Quadboard, 256K, four function board	\$ 995	\$67
Microfazer, Snap-on. 8K, Par/Par, Epson, #MEB, w/PS1	\$ 159	\$14
Microfazer, Snap-on, 64K, Par/Par, Epson, #ME64, w/PS1	\$ 299	\$23
Power Supply for Microfazer, (9V, 25A), #PS1	\$ 20	\$ 1



\$239 \$ 75



Control Data OR Tandon

DISK DRIVES, Double Sided 320K. Same as now			
supplied with IBM—PC. Tested, burned-in and with installation instructions. 90 day warranty by us.	1 each 2 or more	\$ 595	\$249 \$239
mistaliation mistractions. 30 day narranty by us.	Z UI IIIUIE	4 222	4233

PRINTERS AND ACCESSORIES

	EPSON. See Epson section below		
	NEC, Dot Matrix, 8023 Printer F/T	\$ 695	\$525
	STAR MICRONICS, 9x9 Dot Matrix, 100cps, 2.3K, Gemini 10"	\$ 499	\$385
	9x9Dot Matrix, 100cps, 2.3K, Gemini 15"	\$ 649	\$495
	APPLE COMPUTER. INC., Silentype Printer for Apple II	\$ 395	\$335
	IDS, Microprism 480, near letter quality, 110 cps, 80 col.	\$ 799	\$699
*	Prism 80 Color, 200cps (all options-color, sprint, auto)		\$1450
	Paper Tiger, 440 w/Graphics and 2K. Limited Special	\$1295	\$495
*	LETTER QUALITY - DAISY WHEEL PRINTERS:		
	OLYMPIA, ES-100. Printer/Typewriter, complete with all		
	interlacing to the Apple II	\$1735	\$1295
	COMREX, Comriter CR-1, RS232 Serial I/F, 200 wpm	\$1199	\$845
	Comriter Tractor Feed for CR-1	\$ 118	\$ 99
	SUPPLIES: Tractor Feed Paper, Ribbons. Heads, Qume Daisy	Wheels &	Ribbons.

EPSON PRINTERS & ACCESSORIES

₩ MX80 F/T III, with Graftrax+	\$ 745	\$525
MX100 F/T III, with Graftrax+	\$ 995	\$695
IBM-PC to Epson Cable	\$ 60	\$ 45
Apple Interface and Cable for MX80 or MX100	\$ 95	\$ 59
Grappier+ by Orange Micro, sperilly printer	\$ 165	\$119
Apple Graphics Dump	\$ 15	\$ 9
Atari to Epson Cable	\$ 40	\$ 30
Other cables, interfaces, ribbons, heads and paper in stock,		Call
		_

8" CP/M-80 BUSINESS & SYSTEM SOFTWARE

	PRICE	PRIC
W ACUTON TATE 4D II		\$419
ASHTON-TATE dBase II	\$ 700	\$ 39
COMSHARE TARGET, Target PlannerCatc Masterplanner	\$ 99	\$225
PlannerCalc Applications Pkg.	\$ 325 \$ 50	\$ 40
PlannerCalc Combo Pkg.	\$ 125	\$ 65
INFOCOM. Deadline	\$ 60	\$ 4
Zork or Zork or Zork or Starcross, each	\$ 50	\$ 39
ISM. MatheMagic	\$ 100	\$ 7
MICROCRAFT, Legal Billing & Time Keeping	\$ 750	\$39
Prof. Billing & Time Keeping — Billkeeper	\$ 750	\$39
MICROPRO, WordStar® plus free WordStar Training Manua		\$24
MailMerge ^{T M}	\$ 250	\$ 7
SpeliStar™	\$ 250	\$12
3 Pak, Word & Mail & Spell, 3 above	\$ 845	\$39
SuperSort	\$ 250	\$16
DataStar	\$ 295	\$19
CalcStar	\$ 145	\$ 9
MICROSOFT Multiplan Fortran 80	\$ 275	\$199
IVIICA GOOF 1 Fortran 80	\$ 500	\$32
BASIC Compiler	\$ 395	\$29
COBOL-80	\$ 750	\$54
BASIC-80	\$ 350	\$27
muLisp/muStar-80	\$ 200	\$14
M-Sort-80	\$ 195	\$14
Edit-80 Macro-80	\$ 120	\$ 8
OASIS. The Word Plus (45.000 word verification)	\$ 200 \$ 150	\$14
PEACHTREE, Magic Wand	\$ 500	Ca \$19
Series 4 GL, AR, AP or Inventory, each	\$ 600	\$39
Series 8 GL, AR, AP, Inv. or Pav. each	\$ 750	\$49
Series 9 Peach Text	\$ 500	\$33
Series 9 Spelling Proofreader	\$ 300	\$19
Series 9 Calc. Mail List or Telecomm., each		\$24
PERFECT SOFTWARE, Perfect Writer TM	\$ 389	\$23
Perfect Speller ^{T M}	\$ 189	\$11
Perfect Filer	\$ 289	\$17
	+ 200	

MONITORS

MOMITORS			
NEC. 12" Green	\$	249	\$15
12" Color, Composite	\$	450	\$34
SANYO, 9" B&W	s	190	\$14
9" Green	Š	200	\$13
12" Green	\$	260	\$19
13" Color, Composite	S	470	\$34
13" Color RGB	S	995	\$79
ZENITH, 12" Green	\$	150	\$11
AMDEK, 12" Green #300	S	200	\$15
13" Color I, Composite	S	449	\$35
13" Color II, RGB, Hi Res. (Ap. II, III & IBM-PC)	Š	899	\$79
13" Color III, RGB, Commercial, (Ap. 11, 111)	\$	569	\$46
DVM. Color II or III to Apple II Interface	2	199	\$17
Note: Color II and III come with cable for IBM-PC.	٠		•

MODEMS AND

TELE COMMUNICATIONS	TERI	MIN	AL
HAYES, Micromodem II (for the Apple II)	\$	379	\$275
Apple Terminal Program for Micromodem II	\$	99	\$ 69
NOVATION, Applecat II Modem	\$	389	\$269
212 Apple Cat	\$	725	\$599
HAYES. Stock Chronograph (RS-232)	\$	249	\$189
Stock Smartmodem (RS-232)	\$	289	\$225
Smartmodem 1200 (RS-232)	\$	699	\$535
Micromodem 100 (S-100 bus)	2	399	\$275
SIGNALMAN, Modem MKI (RS-232)	\$	99	\$ 79
IBM-PC to Modem Cable	\$	39	\$ 29
AXLON, Datalink 1000 Hand Held Communications Ter	rminal \$	399	\$325

*. CORVUS SYSTEMS

★ 6 Meg Hard Disk, w/o interface ★ 11 Meg Hard Disk, w/o interface 20 Meg Hard Disk, w/o interface	\$2995 \$4795 \$5795	\$2095 \$2695 \$3495
BM PC Interface (IBM DOS), Manual & Cable 5	\$ 300	\$239
Mirror built in for easy backup	\$ 790	\$595
Apple Interface. Manual & Cable 5	\$ 300	\$239
Omni Disk Server for Apple II (Special)	\$ 990	\$495
Omni Transporter Card Apple II (Special)	\$ 495	\$275
Omni Junction Box Set (Special)	\$ 39	\$ 25
Other Interfaces, Omni-Net, Constellation, Mirror, All in Sto	ck.	

	H/P 7470A Graphics Plotter	\$1550	\$1195
hn	H/P 41C Calculator	\$ 195	\$149
$\mu \mu$	H/P 41CV Calculator with 2.2K Memory Full 41 accessory and software in stock.	\$ 275	\$219
	Full 41 accessory and software in stock	Call.	

Portland, OR. Cash & Carry Outlet, 11507-D SW Pacific Hwy., Terrace Shopping Center, Tigard, OR. Over-the-counter sales only, On 99W between Rte, 217 and Interstate 5. Open M-F 10-6, Sat. 10-6, Call 245-1020.

ORDERING INFORMATION AND TERMS: All mail to PO. Box 1380, Jacksonville, OR 97530.

Checks and Government Checks. Personal or Company Checks allow 20 days to clear. No C. O. D. Add 3% for VISA or MC. Include telephone number. Add 3% for Start and Days to clear. No C. O. D. Add 3% for VISA or MC. Include telephone number. Add 3% for Start and Days to clear. No C. O. D. Add 3% for VISA or MC. Include telephone number. Add 3% for Start and Days to clear. No C. D. Add 3% for VISA or MC. Include telephone number. Add 3% for Start and Days to clear. No C. D. Add 3% for VISA or MC. Include telephone number. Add 3% for VISA or

OUR REFERENCES: We have been a computer dealer since 1978 and in mail order since 1980. Banks: First Interstate Bank, (503) 776-5620 and Jefferson State Bank. (503) 773-5333. We belong to the Chamber of Commerce, (503) 772-6293, or call Dun & Bradstreet il you are a subscriber. Computer Exchange is a division of O'Tech Group, Inc

LOW PRICES TO PROFESSIONALS WHO KNOW WHAT THEY WANT AND KNOW HOW TO USE IT.

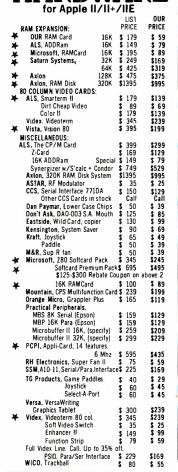
Manufactured Bell & Howell by Capple computer

CALL US ON THE APPLE IIE

	LIST	OUR
	PRICE	PRICE
B&H APPLE II+		
64K (48K + OUR 16K CARD)	¹ 1725	^{\$} 1150
Disk, Micro Sci A2 w/3.3 Controller	³579	³ 378
Disk, Micro Sci A2 Only	³ 479	³299

apple"II/II+/II<u>E</u> supply center





NEC LIMITED S	PECIA	
8001 32K Computer	\$ 995	\$699
286K Total, Dual Drive PC8031	\$ 995	\$699
32K addon and 1/0 Unit PC8012		\$485
Call for other software and accesso	ries.	

Appie Appie II+ only in that It's in black hammertone color and its warranty is longer. Warranty: Factory warranty is by Bell and Howell (not by Apple) and is one year parts plus 90 day labor. Warranty service available at Bell and Howell service centers or return to Computer Exchange.

The B&H Apple II+ differs from the Apple Apple II + only in that it is in

B & H APPLE II+

64K STARTER SYSTEM

utility programs
Sanyo 9" Green Monitor
RF Modulator (for color TV)
Game Paddles · Game with Color Graphics and Sound

For Apple II
A2, 5¼", 143K Disk Drive
Controller Card for A2 Drive
A40, 5¼", 160K Disk Drive
A70, 5¼", 286K Disk Drive
Controller for A40 or A70

OUR 16K RAM Card, 2 Year Warranty
Micro Sci A2 Disk Drive with 3.3 Controller
Central Point Filer, Apple II+ 3.3 DOS plus many

MCRO-SCI FORTHE APPLE II/II+,III
DIRECT SUBSTITUTES
for APPLE DRIVES Micro-Sci A2 drives and/or controllers are direct plug compatible substitutes for Apple drives and controllers.

WHILE THEY LAST

LIST OUR

> \$299 \$ 79 \$359 \$479

\$ 479 \$ 100 \$ 449 \$ 599 \$ 100 \$ 20

\$1.595 **SAVE \$ 834**

on disk for Apple II/II+/IIE

		-		
	BUSINES	ç		
ALC: YOU		_	-	-
	A-1 0	F	LIST	OUR Price
	Apple Computer, Inc. The Controller GL, AR, AP	s	625	\$399
	Apple Writer II	š	150	\$119
	Apple Pascal	Š	250	\$199
	Apple Fortran	\$	200	\$159
	DOS Tool Kit	\$	75	\$ 59 \$ 59
	DOS 3.3 Upgrade Kit Apple Pilot	ŝ	75 150	\$119
	DJ Portfolio Evaluator	š	50	\$ 45
	How to!	S	50	\$ 25
	Microcourier	\$	250	\$125
	Micro Telegram Apple Logo	\$	250	\$125
	Applied Soft Tech., VersaForm	Ş	175 389	\$149 \$265
	Artsci, MagicWindow II New!	š	150	\$ 99
	Ashion-tate, dBase II (CP/M)	\$	700	\$419
	Continental, GL, AR, AP or PR. ea		250	\$169
	1st Class Mail Home Accountant	\$	75 75	\$ 49 \$ 49
	Hayden, Pie Writer (Specify brd.)	ŝ	170	\$ 99
×	High Tech., Job Control Sys.	Š	750	\$350
7	Info Master	\$	189	\$119
	Howard Soft,			****
	Real Estate Analyzer II Tax Preparer	Ş	195 150	\$129 \$ 99
	Info. Unlim., Easywriter (PRO)	ŝ	175	\$119
*	ISA, Spellguard (CP/M)	š	295	\$ 99
•	LJK, Letter Perfect w/Mail Merge	\$	150	\$ 99
¥	Micro Craft, (CP/M)			****
	Professional Billkeeper Legal Billing & Timekeeping	Ş	750 750	\$395 \$395
	Micro Lab, Invoice Factory	į	200	\$ 99
	Tax Manager	Š	150	\$ 99
	Micro Pro, (all CP/M)			
	WordStar® + Training Manual MaiiMerge ^{T.M.}	\$	495	\$199
	SpeliStar ^{T.M}	Ş	250 250	\$ 69 \$ 99
	SPECIAL! All 3 above	š	895	\$349
	Data Star T.M.	Š	295	\$149
¥	Microsoft, Multi-Plan (CP/M)	\$	275	\$175
	Multi-Plan (DOS 3.3) New!	Ş	275 175	\$175
	Muse, Super Text 40/80 Super Text 40/56/70 New		125	\$129 \$ 95
×	On-Line, ScreenWriter II	š	130	\$ 89
•	The Dictionary New!	\$	100	\$ 69
	General Manager II New!		230	\$155
u	Dsborne/C.P. Soft, (Disk and Bo)	
4	Some Common Basic Programs 75 Business, Statistics and Mati			
	programs for the Apple II	s	100	\$ 49
¥	Practical Basic Programs	Ť		
	40 more very valuable program		100	
	beyond "Some Com BasicProg"		100	\$ 49
	Peachtree, Requires CP/M and Videoterm or 40 columns.	М	BASIC.	Specify
	Series 40 GL, AR or AP, each	s	400	\$275
	5663 40 GE, MI OF MI , COUI	•	,00	4213

			RICE	PRICE
	Series 40 GL & AR & AP, all 3		595	\$395
	Series 40 Inv. or Pay., ea. Series 9 Text & Speil & Mail, all 3	Ş	400 595	\$275 \$395
	Series 80 GL & AR & AP. Videx	š	595	\$395
	Perfect, Perfect Writer	š	389	\$239
	Perfect Speller	š	189	\$119
	Perfect Filer	\$	289	\$179
	Quality, GBS w/3 gen. (a DBMS)	ş	650	\$475
	Sensible, Sens. Speller, specify Silcon Valley, Word Handler	\$	125 250	\$ 85 \$139
•	Sof,/Sys., Executive Secretary	š	250	\$169
	Executive Speller	š	75	\$ 55
	Solidus/Softech	٠		
*	Stockfile	\$	600	\$350
	Stockseller	\$	700	\$450
	Systems Plus Acctg. Plus, General Ledger	s	425	\$295
	Acctg. Plus, GL, AP and A/R		995	\$595
	Acctg. Plus, above + Inventory		395	\$775
	Software Publishing.			
	PFS II	\$	125	\$ 85
	Report	\$	95	\$ 65
	Graph Southeastern Data Capture, call t	\$	125	\$ 85
	Stoneware, DB Master	\$	229	¥. \$155
	DB Utility I or II	š	99	\$ 69
	Videx.			
	Applewriter II preboot disk	\$	20	\$ 15
	Visicalc to 64K preboot disk Viscalc to 176K preboot disk	Ş	50 90	\$ 39 \$ 69
	VisiCorp/Personal Software.	3	90	2 03
	Visicalc 3.3	2	250	\$179
	VisiDex Special!			
		s	250	\$150
	VisiFile	\$	250	\$179
	VisiFile Desktop Plan II	\$	250 250	\$179 \$179
	VisiFile Desktop Plan II Desktop Plan III	\$	250 250 300	\$179 \$179 \$219
	VisiFile Desktop Plan II Desktop Plan III Visiplot	\$ \$ \$	250 250 300 200	\$179 \$179 \$219 \$149
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule New!	\$ \$ \$ \$ \$	250 250 300 200 300	\$179 \$179 \$219 \$149 \$219
	VisiFile Desktop Plan II Desktop Plan III Visiplot	\$ \$ \$	250 250 300 200	\$179 \$179 \$219 \$149
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTend & VisiPlot VisiTerm & VisiPlot	\$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100	\$179 \$179 \$219 \$149 \$219 \$219 \$219 \$ 79
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTerm UTILITY & DEVELO	3 5 5 5 5 5 5	250 250 300 200 300 300 100	\$179 \$179 \$219 \$149 \$219 \$219 \$79
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTerm VITILITY & DEVEL Beagle, Utility City	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 210	\$179 \$179 \$219 \$149 \$219 \$219 \$79 ENT
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTend & VisiPlot VisiTerm UTILITY & DEVEL Beagle, Uthity City DOS Boss	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 2M	\$179 \$179 \$219 \$149 \$219 \$219 \$ 79 ENT
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTerm VITILITY & DEVEL Beagle, Utility City	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 210	\$179 \$179 \$219 \$149 \$219 \$219 \$79 ENT
	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTern UTILITY & DEVEL Beagle, Utility City DOS Boss Anpple Mechanic Central Point Software Filer, DOS Utility	3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 24 30 24	\$179 \$179 \$219 \$149 \$219 \$79 ENT \$ 22 \$ 18 \$ 22
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot Con II Plan Software Filer. DOS Utility Copy II Plus (bit copier)	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 24 30 24 30 40	\$179 \$179 \$179 \$219 \$219 \$219 \$ 79 ENT \$ 22 \$ 18 \$ 22 \$ 15 \$ 35
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTernd & VisiPlot VisiTern UTILITY & DEVEL Beagle. Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump	3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 24 30 24	\$179 \$179 \$219 \$149 \$219 \$79 ENT \$ 22 \$ 18 \$ 22
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTerm UTILITY & DEVEL Beagle, Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy IP Plus (bit copier) Epson, Graphics Dump Insoft,	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 24 30 24 30 40 15	\$179 \$179 \$119 \$149 \$219 \$219 \$79 ENT \$22 \$ 18 \$ 22 \$ 15 \$ 35 \$ 9
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiSchedule VisiTrend & VisiPlot VisiIrend & VisiPlot Contral Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump Insoft. GrafORTH by Paul Lutus	3 3 3 3 3 3 3 3 3 3 3 3 3 3	250 250 300 200 300 100 24 30 24 30 20 40 15	\$179 \$179 \$119 \$149 \$219 \$219 \$ 79 ENT \$ 22 \$ 18 \$ 22 \$ 15 \$ 35 \$ 9
¥	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot Beagle, Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump Insoft, GraFORTH by Paul Lutus TransFORTH 11 by Paul Lutus Microsoft,	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 24 30 24 30 40 15	\$179 \$179 \$219 \$219 \$219 \$219 \$219 \$79 ENT \$22 \$ 18 \$ 22 \$ 15 \$ 35 \$ 9 \$ 99
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTrend UTILITY & DEVEL Beagle, Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump Insoft, GrafRTH by Paul Lutus Microsoft, ALD S.	3 3 3 3 3 3 3 3 3 3 3 3 3 3	250 250 300 200 300 300 100 PM 30 24 30 25 15 75 125	\$179 \$179 \$219 \$219 \$219 \$219 \$79 \$79 \$22 \$18 \$22 \$15 \$35 \$9 \$59 \$99
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot Cottal Point Software Filer. DOS Utility Copy If Plus (bit copier) Epson, Graphics Dump Insoft. GraPORTH by Paul Lutus TransFORTH II by Paul Lutus Microsoft. A.L.D.S. BASIC Compiler	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 PM 30 24 30 25 15 75 125	\$179 \$179 \$219 \$149 \$219 \$219 \$219 \$79 \$22 \$ 18 \$ 22 \$ 15 \$ 35 \$ 35 \$ 99 \$ 3 99
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTrend & VisiPlot VisiTrend UTILITY & DEVEL Beagle. Utility City DOS Boss Central Point Software Filer. DOS Utility Copy II Plus (bit copier) Epson. Graphics Dump Insoft. GraPORTH by Paul Lutus TransFORTH II by Paul Lutus Microsoft. A.L. OS. BASIC Compiler Cobol 80	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 24 30 24 30 15 75 125 125 395 750	\$179 \$179 \$219 \$149 \$219 \$79 ENT \$22 \$18 \$22 \$15 \$35 \$9 \$59 \$59 \$79
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot Contral Point Software Filer, DOS Utility Copy IP Plus (bit copier) Epson, Graphics Dump Insoft, GraPORTH II by Paul Lutus Microsoft, ALDS BASIC Compiler Cobol 80 Fortran 80	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 24 30 24 30 15 75 125 125 395 750 195	\$179 \$179 \$219 \$149 \$219 \$219 \$219 \$79 ENT \$22 \$18 \$22 \$15 \$35 \$99 \$75 \$299 \$3149
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump Insoft, GraFORTH by Paul Lutus TransFORTH by Paul Lutus Microsoft, ALD S. BASIC Compiler Cobol 80 Fortran 80 Fortran 80 Fortran 80 FASC Compiler	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 24 30 24 30 15 75 125 125 395 750	\$179 \$179 \$219 \$149 \$219 \$79 ENT \$22 \$18 \$22 \$15 \$35 \$9 \$59 \$59 \$79
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTerm UTILITY & DEVEL Beagle, Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump Insoft. GraPORTH by Paul Lutus Microsoft. ALD S. BASIC Compiler Cobol 80 Fortran 80 TASC Compiler Onega, Locksmith (bit copier)	S S S S S S S S S S S S S S S S S S S	250 250 300 200 300 300 300 100 24 30 24 30 15 75 125 125 125 750 195 175	\$179 \$179 \$219 \$149 \$219 \$79 \$18 \$22 \$18 \$22 \$15 \$35 \$9 \$59 \$75 \$29 \$559 \$159 \$159
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTrend & VisiPlot VisiTrend UTILITY & DEVEL Beagle. Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson. Graphics Dump Insoft. GrafORTH by Paul Lutus TransFORTH by Paul Lutus Microsoft. A.L.D.S. BASIC Compiler Cobol 80 Fortran 80 TASC Compiler Omega, Locksmith (bit copier) Penguin, Comp Graphics Sys. New!	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 24 30 24 30 15 75 125 125 125 195 175 100 70 60	\$179 \$179 \$1219 \$149 \$219 \$219 \$219 \$219 \$219 \$219 \$219 \$21
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot Central Point Software Filer. DOS Utility Copy II Plus (bit copier) Epson, Graphics Dump Insoft. GrafORTH by Paul Lutus TransFORTH II by Paul Lutus Microsoft. AL D.S. BASIC Compiler Cobol 80 TASC Compiler Omega. Locksmith (bit copier) Prequini, Comp Graphics Sys. New Graphics Magician New! Phoenix, Zoom Grafix	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 24 30 24 40 15 75 125 125 175 100 70 60 40	\$179 \$179 \$129 \$149 \$219 \$219 \$219 \$79 \$79 \$79 \$18 \$22 \$18 \$22 \$18 \$22 \$18 \$22 \$18 \$22 \$18 \$22 \$18 \$22 \$18 \$22 \$18 \$21 \$21 \$21 \$21 \$21 \$21 \$21 \$21 \$21 \$21
*	VisiFile Desktop Plan II Desktop Plan III Visiplot VisiSchedule VisiTrend & VisiPlot VisiTrend & VisiPlot VisiTrend UTILITY & DEVEL Beagle. Utility City DOS Boss Apple Mechanic Central Point Software Filer, DOS Utility Copy II Plus (bit copier) Epson. Graphics Dump Insoft. GrafORTH by Paul Lutus TransFORTH by Paul Lutus Microsoft. A.L.D.S. BASIC Compiler Cobol 80 Fortran 80 TASC Compiler Omega, Locksmith (bit copier) Penguin, Comp Graphics Sys. New!	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	250 250 300 200 300 300 100 24 30 24 30 15 75 125 125 125 195 175 100 70 60	\$179 \$179 \$1219 \$149 \$219 \$219 \$219 \$219 \$219 \$219 \$219 \$21

			LIST	OUR PRICE
	Series 40 GL & AR & AP, all 3		595	\$395
	Series 40 Inv. or Pay., ea.	š	400	\$275
	Series 9 Text & Speil & Mail, all 3	\$	595	\$395
	Series 80 GL & AR & AP, Videx Perfect, Perfect Writer	\$	595	\$395 \$239
	Perfect Speller	;	389 189	\$119
	Perfect Speller Perfect Filer	š	289	\$179
	Quality, GBS w/3 gen. (a DBMS)	\$	650	\$475
	Sensible, Sens. Speller, specify	\$	125	\$ 85
٠	Silcon Valley, Word Handler Sof,/Sys., Executive Secretary	\$	250 250	\$139 \$169
	Executive Speller	š	75	\$ 55
	Solidus/Softech			
L	Stockfile	\$	600	\$350
	Stockseller Systems Plus	\$	700	\$450
	Acctg. Plus, General Ledger	s	425	\$295
	Acctg. Plus, GL, AP and A/R	\$		\$595
	Acctg. Plus, above + Inventory	\$	1395	\$775
	Software Publishing, PFS II	\$	125	\$ 85
	Report	š	95	\$ 65
	Graph	Š	125	\$ 85
	Southeastern Data Capture, call t	to		fy. \$155
	Stoneware, DB Master DB Utility I or II	\$	229 9 9	\$ 69
	Videx,	•	33	• 03
	Applewriter II preboot disk	\$	20	\$ 15
	Visicale to 64K preboot disk	\$	50 90	\$ 39
	Viscalc to 176K preboot disk VisiCorp/Personal Software.	>	90	\$ 69
	Visicalc 3.3	\$	250	\$179
	VisiDex Special!	Š	250	\$150
	VisiFile	Ş	250	\$179
	Desktop Plan II Desktop Plan III	\$	250 300	\$179 \$219
	Visiplot		200	\$149
	VisiSchedule New!	\$	300	\$219
	VisiTrend & VisiPlot VisiTerm	\$	300	\$219
		\$	100	\$ 79
Ĺ	UTILITY & DEVEL	0	PM	ENT
	Beagle, Utility City	\$	30	\$ 22
	DOS Boss Apple Mechanic New!	5	24 30	\$ 18 \$ 22
	Central Point Software	•	30	\$ 22
	Filer, DOS Utility	\$	20	\$ 15
	Copy II Plus (bit copier)	\$	40	\$ 35
	Epson, Graphics Dump Insoft	\$	15	\$ 9
	GraFORTH by Paul Lutus	\$	75	\$ 59
	TransFORTH 11 by Paul Lutus	\$	125	\$ 99
	Microsoft,		125	. 75
		\$	125 395	\$ 75 \$299
		š	750	\$559
		Š	195	\$149
	TASC Compiler	\$	175	\$159
	Omega, Locksmith (bit copier) Penguin, Comp GraphicsSys. New!	\$	100 70	\$ 75 \$ 53
	Graphics Magician New!		60	\$ 41
	Phoenix, Zoom Grafix	\$	40	\$ 29
	Quality, Bag of Tricks New!	\$	40	\$ 29

OVERSTOCK SPECIALS •					
FOR APPLE II/					
		179	2	59	
Microsoft 16K RAMCard	Š	195		89	
Saturn Systems, 32K RAM Card		249		69	
ALS Synergizer Pack, 3 above plus	188			The second	
Supercalc plus Condor Jr.	\$	749	\$5	29	
Videx Videoterm, 80 column card	\$	345	\$2	139	
CCS. Serial Interface 7710A	\$	150	\$1	29	
Centronics Interface 7728		110		85	
Calender Clock 7424A		120	\$	95	
Centronics Interface 7720B	\$	1-20	2	95	
HOME & EDUC	1	τiο	N		
HOME & EDOC				_	
		LIST		UR	
	Ρ	RICE	PR	ICE	
Broderbund,			_		
Apple Panic	\$	30		21	
Arcade Machine	\$	45	Ş	40	
Choplifter New! Many others	\$	35		26 Call	
Budgeco. Raster Blaster	S	29		22	
Continental, Home Accountant	Š	75		49	
Datamost, Snack Attack	Š	30	2	24	
Datasoft, Canyon Climber New!	Š	30		23	
Edu-Ware, Several in stock	7	Call		Call	
Auto, Simulations,					
Introductory 3-Pack	\$	50	\$	35	
Hayden, Sargon II (Chess)	\$	35	\$	29	
Infocom, Deadline	************	50	\$	38 25 27	
Insoft, Electric Duet by Lutus	\$	30		25	
Zargs New!	2	35		27	
Spider Raid New!	2	30	\$	24 29	
Lightning, Mastertype	3	40 30	'n	24	
Microsoft, Olympic Decathlon Typing Tutor II	3	25		15	
Muse, Robot War	,	40	. ;	29	
Castle Wolfenstein	Š	30	;	23	
On-Line, Frogger New!	Š	35		25	
Ultima II	Š	55	Š	40	
Softporn (X Rated)	Š	30		22	
Piccadilly, Warp Destroyer	\$	30	\$	23	
Sirius, Gorgon		40	\$	29	
Sir-Tec, Wizardry	\$	50		39	
Knight of Diamonds. New!		35	\$	26	
Sub Logic, Flight Simulator	\$	34		25	
Pinball	\$	30		23	
Strategic, Southern Command OTHER BRANDS IN STOCK, CALL.	\$	60	5	45	
LIMITED SPECI	1000	200			
800 Computer 48K		099		99	
810 Disk Drive	\$	600	54	75	

LIMITED SPEC	AL	
800 Computer 48K	\$1099	\$599
810 Disk Drive	\$ 600	\$475
ATARI 850 Interface	\$ 220	\$169
410 Recorder	\$ 100	\$ 79
Axion,		
Rampower 128K System (for 800)	\$ 475	\$350
Rampower 48K Module (for 400)	\$ 185	\$135
Rampower 32K Module (400 or 800)	\$ 120	\$ 89
Free with above 3: Ramscan, Diagnostic	Diskette.	
Call for other software and accessories,	25% to 5	0% off.

LIMITED SPECIA	L		
(Ecommodore			
VIC 20 Home Computer \$	300	\$179	
Datasette VIC 1530	75	\$ 59	
Disk Drive VIC 1540	399	\$349	
Call for other coftware and accessories	254	to 50% off	

All Other Orders Including Oregon: 772-3256

NATIO NAL NATIONAL TOLL FREE (800) 547-1289

AD #959 THE WORLD'S LARGEST COMPUTER MAIL ORDER FIRM

ALL MAIL: P.O. Box 1380, Jacksonville, OR 97530

WAREHOUSE AND OFFICES. BY APPOINTMENT AT 6791 UPPER APPLEGATE ROAD

Standards Are Volatile

You might think that an official standard is as stable as a mountain. Most standards are in fact more stable than Mount St. Helens but not as stable as Gibraltar. ANSI brings up standards for review every five years, when they may be reaffirmed, revised, or withdrawn. If the responsible committee does not act, the standard automatically dies. Sunset laws appeared in standardization before they appeared in government.

Revisions to the editorial content of the standard specification are the most common; technical changes are more rare and must be treated as if a new standard were in development, with all the necessary meetings, documents, etc.

The constant review process protects both computer-product vendors and users from technological stagnation caused by fixed standards. But consequently, the standard's name must carry a date, which becomes very significant if changes are made. For instance, FORTRAN programmers must

be aware of the changes made between the 1966 FORTRAN standard and the 1977 revision of the language (American National Standard X3.9-1978).

Because major changes in a standard might prove to be detrimental to both industry and consumers by making items obsolete, some standards are stabilized through the process of registration. When a standard is registered, as for instance the ASCII (American National Standard Code for Information Interchange) character set, an entry is made in the broadly circulated standards registers. When changes are made to the character set standard (as happened in 1977 and may happen again in 1984), the new entries will be placed in the same standards registers while the original entry remains unchanged. In this way, several versions of a standard can exist at the same time. Using this method helps to avoid repeating the entire standardization process when there is a need to make changes.

as American National Standards, it can use the Canvass Method. In this event, the group takes a canvass or mail poll of all organizations that are known to have concern for and competence in the subject.

The organization proposing the standard becomes the sponsor and is responsible for preparing the canvass list. Generally, a six months' time limit is placed upon responses to the poll.

When the canvass ballot period closes, the sponsoring organization must submit all pertinent documentation to the standards-approving organization. This documentation includes the standard being proposed, the canvass list, the comments received, and the sponsor's responses to adverse comments. For example, these materials would be sent to ANSI, and futher processing as an American National Standard proceeds. The programming language Ada has recently progressed through this method.

Standards Committee Method

The Standards Committee Method

is the one best known to the computing industry. It is used when one or more organizations have developed or are developing standards on the same or related subjects.

The method described here is the ANSI version. However, the fundamental principles are identical to those at the international and local levels. As an example, the factors applied to the decision to form a standards committee are the same in ANSI as in ISO. Additionally, the ANSI responsibilities in establishing a Standards Committee, watching its progress, and acting upon its output are identical to those of the comparable ISO councils.

The Standards Committee Method consists of a secretariat (administrative-support group) and a standards committee embodying a balanced representation of consumers, producers, and general interests. In many cases, a sponsor may also be involved.

The terms secretariat and sponsor are often used synonymously, but each has a distinct place in the standardization process. The secretariat

plays an important role in the efficient functioning of the standards committee. While a secretariat is always associated with a standards committee, a sponsor need not be. The secretariat organizes and appoints officers to the standards committee and generally handles all of the administrative work for the standards committee. The relationships of standards organizations and secretariats can be confusing at times, as each can fulfill several roles. As examples, CBEMA was authorized by ANSI to act as the secretariat for American National Standards Committee (ANSC) X3, and ANSI itself holds several ISO secretariats, among which is that for ISO/TC 97.

A sponsor, as defined by ANSI, is "an organization or group which assumes responsibility for development and publication of its standard and subsequently submits it to the institute for approval under any of the methods covered in these procedures." As an example, the American Society for Testing and Materials acts as a sponsor of ASTM standards when these are proposed as American National Standards. By this definition, CBEMA cannot be a sponsor because it does not develop its own standards.

Standardization Process

Regardless of the method used to submit a proposed standard, the objective of the approval process is to confirm that consensus has been reached. Within this process, four requirements must be met: all substantially concerned parties must have an opportunity to express their views, and these views must be considered; significant conflicts with other American National Standards must be resolved; consideration must be given to existing national and international standards; and evidence of compliance with ANSI procedure must be shown.

The process to accomplish all of this occurs in three phases.

1. Planning: A standard is proposed, and a judgment is made as to its value to the industry. A committee is authorized to accomplish the

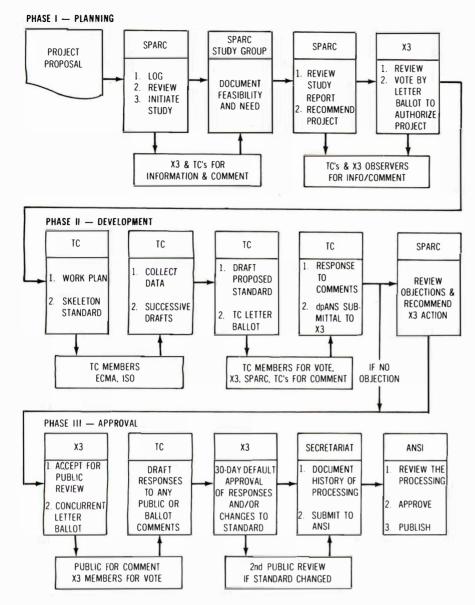


Figure 3: The standardization process is divided into three stages: planning, development, and approval. This flowchart depicts the milestones in each stage, beginning with the project proposal to SPARC (Standards Planning and Requirements Committee of ANSC X3), through the appropriate technical committees (TC) and ANSC X3 (American National Standards Committee for Information Processing Systems), culminating with submission to the secretariat and finally to ANSI.

- work, and a public announcement is issued to that effect.
- 2. Development: A committee is formed (or assigned) to develop the standard or standards. When work is completed, the proposed standard is transmitted to the approving body.
- 3. Approval: Approval is obtained through the hierarchical structure of the approving body, and the standard is published.

See figure 3 for an example of these phases in the ANSC X3. To satisfy the commitment to consensus, each phase includes requirements for balanced representation, distribution of information, and approvals. If this is a national standard effort, the liaison and joint participation required for developing an international standard are also found in each phase.

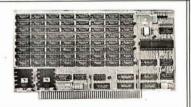
Planning Phase

Any standardization organization may consider a request to establish a standards committee for a particular subject. The request is forwarded to a technically oriented advisory authority within the standardization organization. In ANSI, the Executive Standards Council assigns the subject to a Standards Management Board.

In evaluating the request for initiation of a standards committee, the foremost consideration is that those concerned with the subject have an opportunity to express their views. For this purpose a general conference may be convened, a poll may be



Computer Solutions We sell SemiDisk for S-100 IBM Personal Computer TRS-80 Model 2



Computing has entered a new era: The SemiDisk era! No longer are you tied down by the speed of floppies or winchesters. Your computer can operate many times faster with a SemiDisk. And with our self installing software it couldn't be easier. Just plug in and hold on! No kidding! Special pricing: \$1595 for 512K Byte and \$2495 for 1 meg Byte. Specifications:

TYPE: Semiconductor Disk Emulator

CAPACITY: 512k or 1Mb

POWER REQUIREMENTS: 0.6A (512k) 0.9A (1Mb) BATTERY BACKUP: 10-12V Unrèg. (optional)

Dealers Wanted

For information contact: Computer Solutions Robert Pinkham P.O. Box 931 Hillsboro, OR 97123 (503) 640-5665

taken to determine interest in the subject, or a research study may be undertaken by an ad hoc study group.

When the decision has been made to form a standards committee, appropriate notices are issued to the press and interested parties are encouraged to participate. The Standards Management Board then appoints a secretariat for the committee.

Development Phase

The work of the standards-development committee culminates in the transmittal of a proposed standard to the cognizant authority. This is preceded by a ballot to verify that consensus has been reached. If only one subject was assigned to the committee, the committee ceases to hold meetings but remains ready to process the comments generated during the approval phase of the proposed standard. It should be noted here that if any changes must be made in the technical content as a result of a ballot, the proposed standard is

returned to the standards-development committee.

Approval Phase

The approval phase begins when the secretariat receives the proposed standard with the request that it be processed as a national or international standard. The secretariat first determines that all the required documentation has been submitted and then distributes the document for review prior to taking a formal ballot. If comments are received during the balloting process, these are forwarded to the development committee for resolution, and the proposed standard may then be returned to the secretariat for review. The nature of the comments (substantive or editorial) determines whether the next step will be further changes or transmittal to the next higher level of authority.

The proposed standard now enters the stage where processing will be completed to make it a national or international standard. From this point on, no decisions are made on the technical content; the total emphasis is on the evidence of consensus. When the existence of consensus has been validated, the standard-development cycle is complete. The proposed standard is then published in its entirety, or a notice is published indicating that the standard is available.

Operating Procedures

An understanding of the operating procedures of various standards organizations provides one of the best avenues to an understanding of the total process of standardization. It is here that you can best appreciate the checks and balances that constitute the development of a standard and come to understand the slow, laborious, and frequently frustrating delays, which to an outsider seem unwarranted but which are part of the process.

Basic to the process of standardization are the ballot procedures and member involvement. Both of these are indispensable to achieving consensus.

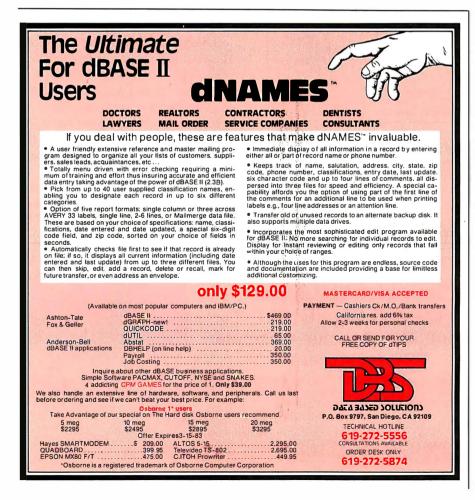
ANSI Voting Procedures

Let's examine the important voting process in detail. The voting period for the letter ballots of a standards committee is six weeks from the date of issue. The results of the ballot remain confidential to the secretariat and the committee officers until the ballot period closes.

When the ballot period closes, the secretary of the standards committee forwards the ballot tally to the chairman of the standards committee, who determines whether consideration of unresolved negative votes and comments shall be by correspondence or by a meeting of the standards committee or subcommittee involved.

(Often, committee members vote "no" on a given ballot because of minor objections to either the proposed standard or its specifying document. A simple clarifying statement in the standard can change a "no" to a "yes"; the vote is said to have been resolved.)

If technical changes must be made to resolve negative votes, these



changes must be submitted to the standards-committee membership within the four-week period given for responses. Those who voted in the affirmative must either reaffirm their vote in the light of any substantive changes or cast a negative vote. If negative votes cannot be resolved, these must be reported to the membership of the standards committee, with the reasons given for the negative votes. Each voting member, on receipt of unresolved negative votes and comments from those balloted, must indicate whether or not this affects his original vote. The final result is recorded and reported to the secretariat and to the membership of

At this point, the secretariat may use its discretion as to whether the proposed standard is ready to be submitted for ANSI approval. If at least two-thirds of the standards committee members voting have approved the standard, it is mandatory that the proposed standard together with the necessary exhibits be submitted to ANSI. If this is not done by the secretariat within one calendar month of the ballot closure, one or more of the members of the standards committee may offer the proposed standard for approval.

the standards committee.

When the proposed standard reaches ANSI it is examined by the staff to determine that the documentation required has been forwarded and that evidence of consensus exists. just as was done when the proposed standard was submitted to the secretariat for a ballot by the standards committee.

The proposed standard is now submitted to the vote of the Board of Standards Review, which requires an affirmative vote of not less than twothirds of the full board, taken by written ballot.

Documents

The names of the standards documents will give you a clue to the stages in the standardization process. As the documents containing a proposed standard specification move through the standardization process, the changes in document names indicate the level of acceptance the Rugged, simple, dependable.

RCA Interactive Data Terminals as low as \$255.



Reliable, portable RCA VP 3000 series Interactive Data Terminals feature: video and audio output; color-locking circuitry for sharp color graphics and rainbowfree characters; reverse video; tone and noise generator; 20 and 40 character formats; resident and

programmable character set; LSI video and microprocessor control. All have a unitized 58-key, 128 character keyboard with flexible membrane switches, plus the features of the ASCII keyboards below.

VP 3501 Videotex Data Terminal. (Shown) Built-in RF modulator and 300 baud direct-connect modem. Ideal for time sharing data base applications. Works with standard TV or monitor. Also has expansion interface and 16-key calculator keypad. As low as \$275.*

VP 3303 Interactive Data Terminal. Similar to VP 3501, without modem or calculator keypad. Has selectable baud rates and RS232C/20Ma current loop interfaces. As low as \$262.*

VP 3301. Same as VP 3303, without RF modulator. As low as \$255.*

...and RCA ASCII Encoded Keyboards as low as \$56.*

RCA VP 600 series ASCII keyboards feature: flexible membrane keys with contact-life over 10 million operations; unitized keyboards are spillproof, dustproof with finger positioning overlay and positive keypress; 2-key rollover circuitry;



tone feedback; high noise immunity CMOS circuitry; 5V DC operation and 58-key, 128-character keyboard, selectable "upper case only."

VP 616. EIA RS232C compatible, 20 mA current loop and TTL outputs; six selectable baud rates. Standard keyboard plus 16-key calculator. As low as \$88.*

VP 611. Similar to VP 616 with 8 bit parallel output. As low as \$70.*

VP 606. Same as VP 616, less calculator keypad. As low as \$73.*

VP 601. (Shown) Same as VP 611, less calculator keypad. As low as \$56.*

To order, or for more information, call toll-free 800-233-0094. In PA, 717-393-0446. Or write:

RCA MicroComputer Marketing, New Holland Avenue, Lancaster, PA 17604.



Circle 366 on Inquiry card.

^{*}OEM quantity prices.

standard has attained. The following names are used: Working Draft or Preliminary Draft, Proposed Draft or Proposal (proposals submitted for a technical committee ballot), Draft Standard (a Proposed Draft that has received the approval of the technical committee for publication), and Standard (a Draft Standard which has received all the necessary approvals for adoption as a national or international standard).

Member Responsibilities

All standards-committee work is accomplished by volunteers selected from the ranks of the member organizations. At the technical-committee level the individual must be technically competent in the subject and function as an independent "expert." In addition, the participant must become cognizant of all facets of the subject other than his own specific area of expertise in order to understand the viewpoints of other members. This is an essential requirement for obtaining consensus.

In addition to their professional positions within their organizations, participants must plan to spend a fixed portion of their own time on standards-committee work as well as allocate time to inform their own organizations on standards. A detailed knowledge of international protocol is essential so that a technical committee can function properly in the international environment.

International Standardization

International standards are becoming increasingly influential in world trade. Multinational companies find that differing national technical requirements have joined trade tariffs as significant factors in worldwide marketing because they may require a company to produce costly and unnecessary variants of a product. Development of international standards helps resolve these technical barriers to trade.

While it is neither desirable nor intended that international standards should be applied with the force of law, the policy of legislating by "reference to standards" is becoming more and more frequent as technology develops and trade expands. The effective implementation of the "reference-to-standards" technique requires that legislation and regulations be drafted in the form of general requirements that contain references to a standard or a group of standards, which, in turn, provide more detailed explanations of the general requirements, as well as illustrations of the means of meeting the requirements.

If all standards originated at the national level and moved in an orderly fashion to the international level in one organizational structure, few complexities would exist. However, standards originate in many areas and from many organizations and thus involve liaisons with many other organizations. The international organizations best known to the computing community are the ISO, the IEC (International Electrotechnical Commission), and the Comité Consultatif International Téléphonique at Télégraphique (CCITT) of the International Telecommunication Union (ITU).

Conclusion

International standardization provides the solution to the problems of diverse national standards, the protection of consumer interests, and the elimination of trade barriers.

Throughout history, whenever a need for a standard was recognized, the interested parties either formed or designated an organization through which the process of developing standards could take place. Now the development of standards is a vast worldwide activity that could almost be classified as an industry in itself.

Simply put, a standard is a solution to a problem. It is not too surprising then that as our problems get more complex, the process of finding a solution also increases in complexity. Thousands of individuals are involved in standardization work for the computer industry alone, and the work they do affects all of us. Perhaps the information in this article will help you better appreciate the importance of standards and the standards process to our technological world.■

Where to Obtain Standards Information

ACM Standards Committee Association for Computing Machinery 11 West 42nd St. New York, NY 10036

American National Standards Institute 1430 Broadway New York, NY 10018

Computer and Business Equipment Manufacturers Association (CBEMA) X3 Secretariat Suite 500 311 First St. NW Washington, DC 20001

Electronic Industries Association Engineering Department 2001 Eye St. NW Washington, DC 20006

IEEE Computer Society POB 80452 Worldway Postal Center Los Angeles, CA 90080

IEEE Service Center 445 Hoes Lane Piscataway, NI 08854

Information Handling Services Product Management Department 15 Inverness Way E POB 1154 Englewood, CO 80150 (This is a commercial firm that compiles and distributes copies of electronics standards for a fee.)

Institute for Computer Sciences and Technology A200 Administration National Bureau of Standards Washington, DC 20234

United States Department of Commerce National Technical Information Service 5285 Port Royal Rd. Springfield, VA 22161



MDBS III™

Mainframe-quality DBMS from Micro Data Base Systems, Inc. International Software Enterprises—USA (312) 981-9200



INMASS™

Integrated Manufacturing and Accounting Software System MICROCOMPUTER CONSULTANTS (916) 756-8104



ACCOUNTING PLUS™

A comprehensive microcomputer business accounting system. SOFTWARE DIMENSIONS, INC. (916) 722-8000



DATA COMMUNICATIONS **SOFTWARE**

ASYNC, BISYNC & SNA-SDLC protocol data communications software.

IE Systems, Inc. & Micro-Integration, Inc.

OUICK CHECK™

Instant Answers for Money Matters, Bookkeeping/Accounts/Inventory CHUCK ATKINSON PROGRAMS (817) 249-0166



PC/FORTH™

Program development systems for Z-80 and 8086/88 microcomputers Laboratory Microsystems, Inc. (213) 306-7412



The Panasonic portable computer We've improved the way



LINK Panasonic It will improve the way you solve problems. And the solutions come from the portable computing power you have at your fingertips. You can take it with you on planes, cars, boats, anywhere, because it fits into a suitcase. You can be more cost effective in the field, because you'll have access to more information for making on-the-spot decisions. You'll have the incredible advantage of being able to telecommunicate from anywhere you are. It gives you a whole new world of computing. Portable computing.

Software Solutions — Now there's an exciting new software system for the 6502 microprocessor that gives you more

solutions to your problems.

The popular language software for the portable computer includes Extended Basic Compiler/Interpreter, SnapFORTH and Microsoft Basic.®

The Panasonic portable computer also has a wide range of specific

software programs for your specific problems, such as:

<u>The Scientific Calculator</u> — An incredibly powerful tool that solves mathematical problems for the scientist, engineer, and professional wherever they go.

<u>Portabudget</u> — It's your portable personal financial manager. It gives you up-to-the-minute personal control. It allows you to be your own record keeper, savings advisor, accountant, bill manager, credit and charge account guide, investment counselor, portfolio keeper, and tax assistant. Overall, it helps plan your personal financial life, portably.

<u>Portacalc</u> — Gives you the portability and the flexibility to automatically analyze numerical problems wherever and whenever they arise. You can assess "what if" alternative business problems, comprehend key variables in business, and dynamically analyze problems on engineering projects.

<u>Portawriter</u> – It allows you to write, edit, and format information. And, you can telecommunicate the information from wherever you are. Whether you're in the boardroom, hotel room, or even on a golf course, Portawriter gives you full editing and formatting capability for notes, reports, letters, news copy, tables, lists, forms, orders, you name it.

<u>Portalog</u> — It is an easy, precise tool for time-billing professionals without a minute to lose. Whether you're on the road or in the office, you can log time, compile bills, generate billing reports, and track the work of your highly paid employees. Portalog gives you improved timekeeping productivity.

Telecomputing 2[™] — It lets you telecommunicate with your data base. You can establish communications between headquarters and field forces. Exchange files and programs between remote stations. Access timesharing services and store data in a large computer's mass storage. You can also upload and download program data.

with a wide range of new software. you solve problems.

Portaflex – A master program that allows you to create solutions for applications, such as:

- □ Inventory Control Analysis and control of inventory while you're on the job.
- □ Order Entry A customized system for any sales order entry. It offers you productivity, and the advantage of faster order entry.
- □ Field Service Retrieve, diagnose, and analyze your field service data wherever you are in the field.
- Auditing and Accounting Custom auditing and accounting, anywhere you are in the field.
- □ Estimating Versatility for flexible bidding and estimating at your job site.

<u>Software Development Tools for the Customizer</u> — Create your own custom programs and burn them into your EPROM so your program is recorded in nonvolatile form.

Simply take a desk top microcomputer,* insert the software development discs, create your own program, de-bug that program, compile the program, then "burn-in" your problem-solving EPROM.
*Presently offered for Apple II Plus.

Hardware Specifications -

The Panasonic portable computer offers 6502 microprocessor (1 MHz) technology.

- □ It offers 4K or 8K internal nonvolatile RAM
- 48K internal ROM
- □ Built-in Ni-Cad rechargeable battery pack
- □ External AC adapter/recharger
- 26-character liquid crystal display
- □ 65-key completely redefinable keyboard

Introducing Peripherals for Additional Solutions — Modular peripherals let you customize your system.

- □ Multiple RS-232C serial interfaces
- Asynchronous modem with cassette interface (110 or 300 baud)
- □ 40-character microprinter (thermal dot matrix printing)
- □ 8K or 16K RAM memory expansion packs
- X-Y, four-color plotter (up to 80 characters per line)
- TV adapter (32 characters X 16 lines with color and graphics)

The Panasonic portable computer. It's improved the way you solve problems. Because we believe its portable modules and multiple software applications can vastly improve your productivity. And that can be an important solution to your profit problems.

The portable computer from Panasonic. We've improved the way you solve problems.

Panasonic, It's changing the way the world uses computers.



Welcome to the Standards Jungle

An in-depth look at the confusing world of computer connections.

Ian H. Witten
Computer Science Department
University of Calgary
2500 University Drive NW
Calgary, Alberta
Canada T2N 1N4

RS-232C, RS-366, RS-423A, RS-449, V.10, V.11, V.24, V.28, X.21, X.21 bis, X.26, X.27, current loop. . . Welcome to the standards jungle. All these are standards or recommendations designed to help you connect computers to terminals, modems, and computer networks. Why are there so many? What are the differences between them? The similarities? I'll attempt to guide you through this horrendous complication of standards, but first let's take a look at where these standards originated.

The standards or recommendations I'll cover come from two organizations. The standards with the RS prefix are from a United States organization, the Electronic Industries Association (EIA). These are the most widely used standards for computer equipment in North America and hence the world at this time. The standards prefixed by a V or X are from the Comité Consultatif International Téléphonique et Télégraphique (CCITT), a committee of the International Telecommunications Union, which is an agency of the United Nations. The concerns of

the CCITT encompass all aspects of telecommunications worldwide. Because of sometimes conflicting factors influencing its decisions, such as special national requirements and geopolitical concerns, the CCITT

The EIA standards are the most widely used standards for computer equipment in the world.

makes recommendations rather than standards. Although the EIA standards and the CCITT recommendations are almost identical in many cases, they differ somewhat in wording and detail. Additionally, the CCITT has taken a separate direction from the EIA in the past few years, which I will discuss later. (A complete copy of the standards and recommendations can be purchased by writing to the respective organizations: EIA, 2001 Eye St. NW, Washington, DC 20006; and CCITT, United Nations

Bookstore, United Nations Assembly Building, New York, NY 10017.)

An RS-232C Beginning

My jungle tour starts with a whirlwind overview of the standards listed in table 1, after which I'll describe each one in greater detail. A good place to begin is with the most popular standard for connecting computers to modems and terminals. RS-232C. The official title for this complicated standard is Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Interface. The C in RS-232C indicates that it has been revised. This standard includes much more than just the transmit-and receive-data wires you use to connect a terminal to a computer.

The RS-232C standard has four parts: electrical signal characteristics, interface mechanical characteristics, functional description of the signals, and a list of standard subsets of signals for specific interface types. The first part defines the voltages to be used and their interpretations as 0s and 1s. The second gives you the size

SUPER BARGAINS

518



SHARP COMPUTER 249



SUPERBRAIN II

	,
ALTOS — single and m	ulti-user
ACS-8000-15D	Only 4699
ATARI 400	289

PRINTERS
OKIDATA 82A 489 CENTRONICS 739-1 499 IDS PRISM 80 743
EPSON MX-80 FT 547 MX-80 459 MX-100 749
ANADEX 9501A Silent Scribe 1345 NEC #3510 Letter Quality 1623 C. ITOH F10 Letter Quality 1399 Smith Corona TP-1 595
TRAXX 5 ¹ / ₄ " Add-on Drives 249
Memory Merchant 16K static 159 Central Data RAM S-100 64K 299 Systems Group
RAM S-100 64K

AMERICAN SQUARE COMPUTERS is AMERICAN SQUARE COMPUTERS is organizing a World Wide Association of Computer Dealers. Open a Store or Start Work Out of Your Home! We Charge NO FRANCHISE FEE! (Our Competitors charge a FRANCHISE FEE of from \$15,000.00 to \$45,000.00.) Be a Winner! Let US help YOU get started MAKING MONEY by HELPING DECORP TO STANCHIST STANCHI PEOPLE to put COMPUTERS to WORK. Write or Phone today

Which Computers are Best? ... Free Insured Shipping at Low Rates.

> We Repair Computers



TELEVIDEO

Televideo 925 718 Televideo 950 899 Televideo Computers Call
ADDS VIEWPOINT A-1B 469 ZENITH Z-19 Terminal 649 Z-89 48K Computer 2119 Z-90 64K DD 2399 ZVM-121 ZENITH Green Screen monitor 125
INTERTUBE III or EMULATOR \$710 AMDEK Color Monitor \$329

GODBOUT COMPUPRO

Televideo 910+

Super Sixteen 8085/8088. The fastest 8-16 bit computer! Runs 8 and 16 bit code! 128K Static RAM, 6MHz CPU's LIST 3440 SPECIAL 2569

New: Systems 816/A. B, and C with enclosure and drives. 816/A List 5495 Only 4395

SEATTLE pure 16 bit computer is the fastest microcomputer by actual test! S-100, 128K Static RAM, 8 MHz 8086, 22 slot Mainframe

rviodel #2 List 3785 Only \$3028 #1 as above but 64K List 2990 Only \$2392

IBM PC memory made by SEATTLE. Now with "Flash Disk." . . 192K = 697

CALIFORNIA COMPUTER 2210A List \$1995 Only \$1595 Z80, 64K, I/O. Disk controller + CPM. California main frame 484

SYSTEMS GROUP computers run FRIENDLY OASIS Call SAVE

QUAY COMPUTER Two drives + CPM \$1745 Four user MPM 208K + Hard Disk\$5945

TARBELL'S Empire I & II have two 8" disk drives.

The I is single sided, the II is double

FREE Business Software Empire I . . . List 4888 . . . Only 3495

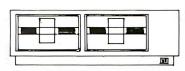
Corvus Hard Disk SAVE SSM Video BRD VB3 kit 361 Spectrum Color ASM 223

One hour free troubleshooting on business systems.



NORTH STAR

ADVANTAGE 64K Green Phosphor. The Best Business Graphics, 2 Disks, Serial Port. Options CPM — Business programs \$2894



MICRO DECISION
"A DEAL YOU CAN'T REFUSE"

64K RAM, Z80, 4MHz, 2 Serial Ports, Disk Controller. FREE SOFTWARE: CPM — Microsoft BASIC — BaZic —Wordstar—Logicalc—Correct-lt.

		List	Only
with 1	5¼" Disk	§\$949	\$1049
with 2	5¼" Disks	1545	1400



NORTH STAR Horizon

Powerful North Star BASIC Free Superb for Business & Science Free Secretary Word Processor

Horizon Standard is now HRZ-2-64K Quad	
Factory Assembled & Tested Only	v
Horizon-2-64K-Quad \$289	
Horizon-1-64K-QHD 5 399	
Harizon DAM CAK	9
Horizon RAM 64K 594	7
Big Sale on Multi-User	_
Time-Sharing SAVE	Ξ
North Star Hard Disk 18Mb 429	
English to Basic Translator 75	
Zbasic 2 to 5 times faster! 325	
Secretary Word Processor 69	Э
Wordstar Word Processor 278	В
Floating Point Board 699	9
Oasis 699	9
CPM for N'-Extra features 147	7
Micro Mike Software CALL	
MICROSTAT \$355	
Pascal-80 539	
Extra Precision BASIC	
140101111010	_
General Ledger	
Accounts Receivable 399	
Accounts Payable 399	_
Inventory 399	
Order Entry 399	Э
PROPAC 1299	Э
DOS + BASIC 5.2 28	3

INTEGRAND main is summarized models to choose from Only 200 & UP INTEGRAND main frames S-100. Many

MODEMS

DC HAYES — S-10	0									,	\$329
POTOMAC MICRO	C	٨	1	4	G	1	2				369
SIGNALMAN											. 97
CAT NOVATION											159
AUTOCAT											215

Full Time Graduate Technician on Duty.



DECISION I

"The IBM-360 on the Z-80 & S-100 BUS!"

Sixteen Programs running simultaneously! Free CPM, Microsoft BASIC, and WORDSTAR with complete system!

DECISION 1 + 65K Static +
8" Disks DMA 3403
DECISION 1 + 65K Static +
2 5 1/4" Disks 2795
DECISION 1 + 65K Static +
5" Disk + 5 Mb Hard Disk 4235
DECISION 1-2user 256K Static +
5" Disk + 5 Mb Hard Disk +
MICRONIX 5830
DECISION 1 — Z-80 + I/O + 65K 1915
DECISION 1 — Rackmount + 20 Mb
HD - 8" DRV Reg. 6235
Inventory Sale 5415

MORROW Hard Disks up to 26 MEGABYTES

HDC-M26
HDC-M20
HDC-M10
DMA-M5
DMA-M10
DMA M10

MORROW 8" Disk
Discus 2D + CPM 600K ... Only \$834
Discus 2 + 2 + CPM 1.2 Mb 1068
Add Drives 2D = 599 2 + 2 = 1795
Discus 2D dual + CPM ... Only 1384
Free Microsoft BASIC from MORROW
with Discus parters as bend 400 with Discus system or hard disk

FAST FIGURE — Most powerful spread sheet. 5¼" or 8" 99

North Star, Morrow, etc. SAVE! CALL

Call for latest prices & availability



Factory Guarantees We Beat Prices

919-889-4577

4167 Kivett Dr.

Jamestown N.C. 27282

919-883-1105

!!!!FANTASTIC PRICES!!!! FROM DIGITAL DIMENSIONS

FRUM DIGITAL DIMENSIONS
OKIDATA ML-80\$339
ML-82A
*ML-83A
*ML-84(seriol)
ML-92
ML-93
PACEMARK 2350CALL
*Includes Tractor Feed
ANADEX DP8000
ANADEX DP9500/9501 \$1279 ANADEX 9500A/9501A \$1359
ANADEX 9300A/9301A
ANADEX DP9620A\$1459
SCM-TP I\$649
120 word/min Daisy Wheel, 10 or 12 pitch,
serial or parallel interface
DAISYWRITER 2000\$1,015
BIDIRECTIONAL 40 CPS AVERAGE THROUGH-
PUT, 48K BUFFER, CENTRONICS, 488,
RS232 & C. LOOP INCLUDED. DAISYWRITER 1500 S
AK Buffer Social Only
DAISYWRITER 1500 P\$925 4K Buffer Parallel Only
IDS PRISM 80\$1,219
Includes sprint mode, dot plot and cut sheet guide
PRISM 80
Includes sprint mode, dot plot, cut sheet guide and 3.4K buffer.
PRISM 132\$1,649
Includes all of above and 4-color graphics
C.ITOH
Prowriter (Parallel)\$489
Prowriter (Serial)
Prowriter 2 (Serial)
Storwriter F10
Printmaster F-10\$1,699
DISK DRIVES RANA ELITE I\$305
MICRO-SCI\$289
MODEMS
HAYES 300 BAUD SMART MODEM\$219
HAYES 1200 BAUD SMART MODEM\$515
E-Z COLOR board\$199
For the Apple II or Apple II Plus.
16-Color, 256 x 192 resolution. Requires
3.3 DOS. Includes demo software and
E-Z COLOR Editor. E-Z COLOR board for S100 Systems \$279
E-Z COLOR board for TRS-80\$239
INTEX TALKER text-to-speech synthesizer. Serial and
parallel interface included\$280
AMDEK 13" COLOR-1\$335
AMDEK 13" COLOR II
NEC JB1201 GREEN Monitor\$159
FOR THE IBM P.C.
Quadram Quadboard w/64k \$429
Quadram Quadboard w/128k\$519
Quadram Quadboard w/192k \$609
Quadram Quadboard w/256k\$699

DIGITAL DIMENSIONS 190 Chapel Rd., Manchester, CT 06040

Info & Orders Call 203-649-3611 Orders Only 1-800-243-5222

C.O.D. Welcome. Allow 2-3 Weeks For Checks. MC/VISA OK. All Prices Include UPS Ground Freight In U.S. CT Residents Add 71/8 Sales Tax. Prices Subject To Change Without Notice.

	EIA	CCITT Approx. Sp Date		Speed/Distance	Purpose			
	RS-232C	V.24, V.28	1969	20,000 bps and 50 ft.	interface specification for modem control, including electrical and mechanical characteristics and func- tional definitions of signals			
	RS-366	V.25			automatic calling unit used in conjunction with a modem to allow a com- puter to dial calls			
	RS-422A	V.11, X.27	1975	10 million bps and 40 ft 100,000 bps and 4000 ft	electrical specification only; two-wire connection for each signal			
	RS-423A	V.10, X.26	1975	100,000 bps and 40 ft 1000 bps and 4000 ft	electrical specification only; one-wire connection for each signal with common return wire			
	RS-449		1977	2 million bps using RS-422A 20,000 bps using RS-423A	interface specification for modem control, using RS-423A as electrical specification, with option of RS-422A for some wires			
		X.21	1976		interface specification for data equipment to public data network, using syn- chronous format and digital rather than analog transmission on telephone networks			
		X.21 bis	1976		modification of X.21 to allow its use with existing synchronous data equipment and analog telephone networks— essentially the same as V.24 and RS-232C			
	current-loop (not officially sanctioned)			10,000 bps and 1500 ft	provides send and return data paths only (no modem control)—not a proper standard—used originally for Teletype terminals and now used on many microcomputers			
Table 1: The standards jungle.								

of the plug and the disposition of the pins. The third, which I'll discuss in most detail, gives a functional description of the 21 signals which make up the RS-232C standard. The fourth part lists about 14 subsets of these 21 signals that are used in different types

of modems. The CCITT recommendation, V.24, is almost identical with RS-232C; however, the electrical signal characteristics are specified separately in a companion recommendation, V.28.

When you access a computer over

Computers for: Business, Home Applications, Resource Management, Technology & S NEW: 15-Day Exchange Privilege (See "TERMS" for details)

Displayed and sold at our Showroom, 12210 Michigan Ave., Grand Terrace, CA.

Extremely sophisticated



KAYPRO II PORTABLE COMPUTER

Beats the competition on every count:

80 col., 24 lines on 9" screen, Z-80, 64K
400K K on 2 Floppy drives (more storage!)

 More free software included: PerfectWriter, Perfect Speller, Perfect Filer, Perfect Calc. spread sheet, Profit Plan finance forecasting, CP/M, PACCO Pr List \$1795 CALL for availability!



Perfect desk-top computer.

• Z-80, 1 Floppy standard, 2nd optional, Optional terminal, or use your own.

• CP/M with user friendly "shell"

• WordStar, SpellChecker, SpreadSheet, Microsoft Basic-80 & BASIC

ZENITH

ZENITH Z-100

TeleVideo

TELEVIDEO 🔈

NorthStar

NORTHSTAR

1602G

ist \$1195 - \$1790, Limited Quantity CALL 3 GRAPHICS SYSTEMS:

Advanced color graphics under Z-BASIC, 16

bit (8088) & 8-bit (8085) 128K RAM, expand-

able to 768K (Expand to 192K for only \$180). Runs most IBM-PC software and CP/M. 3 configurations, 1-2 Floppies. 90 day ON SITE

warranty. List \$3249-4099 \$ CALL

ZENITH Hard Disk S CALL

Superior graphics computer just released.

244,224 pixels, zoom, pan, rubberband! 16 bit (8088), 128/256K Hardware arithmetic option. Networking capability. 2 Floppies 700K CP/M 86 w/Dig. Res. Graphics Language. List \$4495 \$ CALL TELEVIDEO 1602GH: Similar but

10M Hard Disk. List \$6995\$ CALL

High resolution graphics under BASIC Z80A

(4MHz), 16 bit (8088) upgrade only \$499, 64K, 2 Floppies, 720K/Hard Disk 5M.

List \$3559-4999\$ CALL

Graphics Peripherals: IDS PRISM COLOR

List \$1995.....\$ CALL

List \$949 \$ CALL

PRINTER. 200 CPS, high resol. graphics.

AMDEK Digital Plotter. 4-color, flatbed

ALTOS SERIES 5

Extremely sophisticated graphics and color display (1024x1024 pixel) 16-bit (80861), 128K standard, expandable to 256K. 1-28'' Roppies 1 MEG each (run any CP/M program available on 8''). Detachable keyboard. Integral monitor

(monochrome/color). Extensive software.

H01 Monochrome, 1 Floppy, List \$3298 \$ CALL
H02 Monochrome, 2 Floppies, List \$3998 \$ CALL
H03 Color monitor, 2 Floppies, List \$4998 \$ CALL

CALL for appointment

Ideal for Independent business or advanced personal computer user: supports 3 users with independent tasks concurrently. Z-80, 192K, 2 Floppies 2 MEG, expandable to hard disk. Comes with MP/M II, OASIS also available. List \$2990..... CALL for availability

IBM/APPLE PRODUCTS:

HARD DISKS & MICRODISKS: Your backup worries are over.



MEMORY & I/O BOARDS: QUADBOARD: clock, serial & parallel

ports, 128K	\$599
QUAD512 + 64K + serial port	\$369
QUAD512 + 256K + serial port	\$699
QUADSCREEN Super-Monitor	
(166 col.x66 line)	S CALL
QUADCOLOR for better color graphics	\$ CALL
MONITORS & PLOTTERS:	

AMDEK 12" Amber	\$159
AMDEK COLOR II RGB, hi-resolution, 13"	\$699
AMDEK COLOR III RGB	\$382
ZENITH RGB high-resolution RGB	\$524
PRINCETON high-resolution 12" RGB	\$ CALL
NEC 12'' RGB high resolution TYMAC printer-adapter f/APPLE	S CALL
TYMAC printer-adapter f/APPLE	\$89
GRAPPLER	\$129

COMPATIBLE COMPUTER:



COLUMBIA 1600 16-bit 8088, accepts all IBM bounds, reads & runs all IBM software, but has also additional Z-80 processor to run 8-bit C/PM. So compatible it can even use IBM keyboard! 128K, 1 parallel & serial ports standard, 8 expansion slots! COLUMBIA 1600 package: computer as above + keyboard + CRT controller. List \$3,635 \$ CALL

SYSCOM-2: Apple-Compat Computer Fully compatible with APPLE-II, runs APPLE programs. List \$869 \$ CALL

VISA*

BUSINESS OWNERS...Can You afford NOT to computerize?

If conflicting claims for different systems leave you bewildered, if a salesman is 'pushing" a system about which you have doubts, or your costly computer is not delivering its promise-help is now available. Our Business Program divides computer acquisition to 4 phases, and provides 4 disfinct services. Use ONLY the service needed, control your cost at EVERY phase, and pay ONLY for what you get-each of our services is available Independently:

1) ASSESSMENT OF NEEDS: On time-usage basis, you obtain access to our CONSULTANTS, who combine business background and extensive computer expertise, and can discuss your needs with them over the telephone. The initial interview is FREE; then YOU determine how much of the consultant's time you need, charged at \$30/15 min. You pay ONLY for professional, objective advice. No purchase is required now or later.

2) HARDWARE: We carry a large variety of business systems, single and multi-user. You are not locked into any particular concept or product line. Our pricing is highly competitive, and you pay ONLY for the hardware. But, at your option, all equipment sold by us is eligible to be covered in our System Support Program.

3) SOFTWARE: We offer a number of comprehensive lines of business software, all widely used and competitively priced: ACCOUNTING PLUS, CYMA Business and Professional packages, DBASE II, MULTIPLAN. Most important, WE CARRY ONLY SOFTWARE WE ARE ABLE TO SUP-PORT: Contract for software support is available for each module you purchase from us.

4) SYSTEM SUPPORT: Subscription to our SUPPORT SERVICE (\$200/system/year) gives you access to our SOFTWARE SPECIALISTS who answer your questions on time-usage basis. Our Specialists are recruited from the Systems Instructor ranks, and specialize in a single line of software. They have immediate access to systems running your software, so that a 5-minute telephone session with them (at \$10) is much more cost-effective than a 2-hour trip to a computer store, or a 2-day wait for your computer salesman! To Set Up Your Initial

Evaluation Call Our Business Division (714) 781 - 6566

♣TeleVideo

COMPLETE TELEVIDEO MULTI-USER SYSTEM:



Multiple workstations with independent capabilities and tasks: 3 inventory control stations, 2 Accounting Office Stations, 1 Management station (16-bit) with graphics capability. TeleVideo TS-816 CPU with 40 MEG hard disk and tape backup. Complete accounting, inventory control, financial management and business graphics programs operating under Turbo-Dos w/file & record lockout for uninterrupted multi-user service. 1 high-speed dot-matrix printer and 1 letter-quality printer, receive/auto-dial modern. Complete integration included.

List \$29,395 CALL FOR INFORMATION

SMITH-CORONA

AT OUR PRICE, NO COMPUTER SHOULD BE WITH-OUT ONE

Daisy-wheel, letter-quality, interfaces all computers. Serial & parallel models at same low price. No less than 18 print-wheels—only \$6.95 each. List \$849 ONLY \$545!!!

INTERFACES & MODEMS, ETC.

Univer Medamer	
Hayes Modems: SmartModem 300	\$214
SmartModem 1200	
MicroModem II	\$269
MicroModem 100(S-100)	\$289
VENTEL RS-232 Modem	.\$763
MICROFAZER printer buffer	.\$139
INTERFAZER f/multi-users, up to 8 terminals	
& 2 printers!	\$239

SCOTCH DISKETTES by 3M: the very best! \$21/box 51/4 ss dd 5 boxes min ss.dd. 5 boxes min..... \$27/box

COMPUTERS



ressor at V-p price of dedicated w.p. (See Popular Computing 12/82). CP/M, CBASIC, SPELLBINDER w.p. & ULTRACALC included free!!! .\$2349

EAGLE II Z80, 64K, 2 Floppies 780K EAGLE III same but 1 6M EAGLE IV 10M Hard Disk

Software: Accounting Plus All 8 MOD only..... \$1495!!! EAGLE 1600 \$ CALL



GEMINI-10 from **Star-Micronics**

All the features of EPSON-FT, plus backspace, continuous underline,

List \$499 ONLY \$ CALL!!!

GEMINI-15 similar but 15" carriage. Even better buy: List \$649ONLY \$ CALLII!

Additional dot-matrix printers:

NEC-8023A (parallel)	\$459
AXIOM 80 col. 30cps, graph., p	
Okidata 82A (ser/parallel)	
Okidata 83A 132 col. (s/p)	
Okidata 84-P 200 cps. & 50 cps.	
correspondence mode	\$994
Okidata 84-S same, but serial	\$1099
Okidata 92, just released	S CALL
Microprism draft/corresp	
1 -44	

Lough quality printers.	
NEC 3510 33cps serial	\$1449
NEC 3530 same, parallel	
NEC 7710/30 55 cps, s/p	\$2194
DIABLO 620 25cps, ser	
BROTHER HR-1	\$794
DAISYWRITER, 16K Buffer	\$999

Mannesmann-Tally MT-160 heavy-duty serial or parallel, tractor included. \$674

MT 160 L, similar, letter-quality......\$759



APO, FPO. INTERNATIONAL ORDERS ACCEPTED

P.O. Box 3791, Riverside, CA 92519

NEW: COD 15-Day Exchange Privilege (subject to terms below)

ORDERS & INFORMATION:

Mo.-Fri. 9:00 AM-5:30 PM PST, Sat. 10:00 AM-4:00 PM PST

1-(800) 845-5555 CA. AK. HI call (714) 783-1363
BANK REFERENCE: BARCLAYS BANK OF CALIFORNIA (213) 892-7244
VISA MASTERCHARIGE

VISA COLOR TO THE MASTER ACCEPTED

ADDITIONAL TO THE MASTER ACCEPTED

VISA COLOR TO THE MASTER ACC

CP/M is a registered tracemark of Digital Research, Microsoft MultiPlan are trademark of Microsoft Corp. CYMA is trademark of CYMA Corp., TurboDOS is trademark of Software 2000, 280A is registered trademark of Zilog Inc. WordStar, SpellStar, CalcStar, DetaStar, MailMerge are trademark of MicroPro Company. APPLE is trademark of Apple Computer Inc.

telephone lines, the computer must connect to a modem or data set (data set is the term used instead of modem in Bell System literature). The computer's modem communicates through the telephone network to another modem that connects to your terminal. This configuration involves two RS-232C interfaces: one between the computer and its modem and the other between your terminal and its modem. Official terminology labels both the computer and your terminal DTEs (data terminal equipment) and labels the modems DCEs (data cir-

cuit-terminating equipment, most often some sort of data-communication equipment).

Because you often want the choice of using your terminal with a modem or directly connecting it to a computer's output port, the RS-232C standard frequently provides both connections. Strictly speaking, the RS-232C standard was never intended for connecting a DTE device directly to another DTE, and most of its signals are unnecessary in that application. When manufacturers claim that a product is RS-232C-compatible

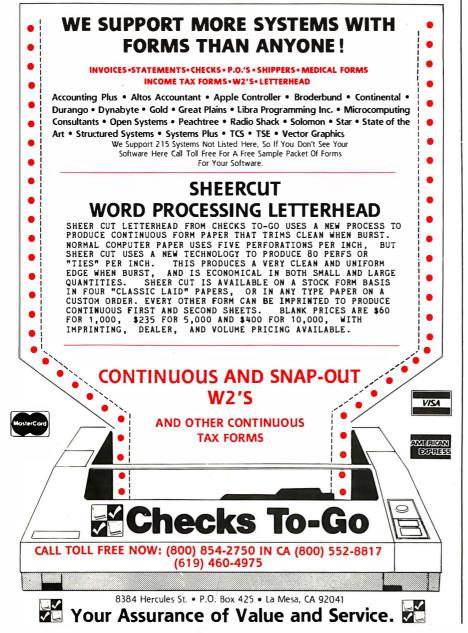
they usually mean that the equipment accepts and generates only a small fraction of the RS-232C signals and also doesn't violate any other parts of the standard.

Generally, the RS-232C standard covers such things as the protocol for answering calls and modem control for reversing the transmission direction in a half-duplex link. It does not, however, cover the requirements for autodial units. This information is provided by the companion specification, RS-366 (comparable to CCITT recommendation V.25), which defines how the computer presents the digits to be dialed to the autodialer, how the computer signals the end of the number, and what occurs when the autodialer cannot successfully complete the call.

The major drawback to RS-232C is its limited transmission distance of 50 feet. In practice, you can go considerably farther, but always at your own risk. A second disadvantage is its maximum transmission speed, although this is not usually a limitation in applications between computers and terminals. While RS-232C can operate at speeds up to 19,200 bits per second (bps), the data rate between computer and terminal is usually 9600 bps at best, and it is very difficult to transmit data even at this slower rate over the switched telephone network

phone network. The distance restriction is not a serious disadvantage if you use modems to access a remote computer. The modems usually sit beside the computer and terminal, and the longhaul transmission takes place between them over telephone lines. In local applications, however, you often find RS-232C connecting terminals directly to computers, simply because it is obviously convenient to use the same terminal and computer interface whether or not a modem connection is used. This is where the 50-foot limit becomes restrictive. Furthermore, the RS-232C voltage levels are not particularly convenient because they aren't the same as those in standard TTL (transistor-transistor logic) and MOS (metal-oxide semiconductor) technologies now dominating computer implementations.





150



GP-100A: US\$389

COMMAND PERFORMANCE.

Seikosha gives you all the best features—including economy and super-clear graphics.

Unlike some graphic printers, Seikosha's new GP-100A Uni-Hammer Graphic Printer puts full dot addressable graphics at your command. The GP-100A lets you repeat a column of data as many times as needed with just one command. Software control enables double-width character output, and the positioning is both character and dot addressable. Designed for simple operation, it ranks among the most cost-efficient graphic printers on the market. Command performance technology that not only works for you now, but takes you well into the future.

Other valuable features:

- Graphics, regular and double width character modes can be intermixed on the same line.
- Automatic printing. When the text exceeds the maximum line length, there is no loss of data due to overflow.
- Self-test printing is a standard feature.
- Centronics type parallel interface.
- Paper width is adjustable up to 10 inches.
- Optional Interface: RS232C, IEEE488, apple II, etc.

Graphic Printer 伏



Available at COMPUTERLAND and other fine stores in your area Circle 381 on inquiry card.

This means you need an additional power supply with this configuration.

Because of these problems with RS-232C, the current-loop interface, made famous by the original Teletype terminals, has come back in fashion, particularly for low-cost home computers. This interface is not a proper standard, with both 20- and 60-milliamp (mA) versions, but it usually works over distances of up to 1500 ft at rates of up to 9600 bps. Unfortunately, the current-loop interface is completely incompatible with RS-232C and requires you to use switchable, dual-standard hardware or conversion boxes. Moreover, the interface comes in two flavors: active. which actually generates the current, and passive, which either detects the current or signals by switching it on and off. The conversion boxes enable passive devices to communicate with active devices. For example, a microcomputer usually contains the active interface and a terminal has the passive one, which means you must have an active-to-active conversion

to directly connect two microcomputers

Overcoming Defects

The EIA introduced standards RS-422A. RS-423A. and RS-449 to overcome the defects of RS-232C and to incorporate and improve upon the advantages of the current-loop interface. A major change was to unbundle the joint electrical, mechanical, and functional specifications of RS-232C. Just the electrical specifications are in RS-422A and RS-423A. To allow you to transmit data at high rates, RS-422A uses two wires for each signal. This setup, known as balanced transmission, doubles the number of wires in the cable. RS-423A transmits at lower speeds and uses one wire as a common return path for all signals. This is called unbalanced transmission and is similar to the design of RS-232C. The RS-423A standard operates in both RS-232C and RS-422A environments and thus provides users of existing equipment with a migration path to move to the new RS-422A regime.

The EIA has introduced RS-449 as its intended successor to RS-232C. The standard provides a complete functional description of the signals needed for modem control, together with the mechanical specification of the plugs and sockets. The electrical specification for most signals is RS-423A, but RS-422A is also available for high-speed operation if necessary. RS-449 has a horrendous number of wires (46 as opposed to the 25 of RS-232C) in two plugs, one with 37 pins and one with 9. Fortunately, most applications don't require the signals in the 9-pin plug. Apart from its improved speed and distance specifications, RS-449 offers some minor functional enhancements over RS-232C in automatic modem testing and a provision for a standby channel, but it still does not incorporate dialing out. The success of RS-449 in the commercial market remains to be seen,

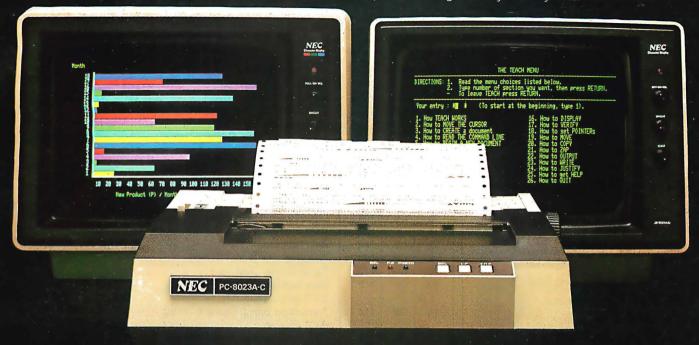
Meanwhile, the CCITT has been steering a different course. With its X.21 recommendation, introduced in

The Most Promising Duet For An Orchestra.



NEC's crisp, clear, high-performance JC1203 RGB color monitor, an industry standard. Also available, the JC1212 composite video version.

NEC's classic JB1201 green monitor, one of microcomputing's performance legends. Easy on the eye, and the checkbook.



Our impressive new NEC dot matrix printer. Parallel interface, 100 cps, 2K buffer, pin or friction feed. Stunning performance and compatibility in the hottest new peripheral of the year.

Give your IBM system some NEC, and watch its performance soar.

Peripherals from NEC can make almost any computer system better.

Our sparkling new JC1203 color monitor is plug and pin compatible with the 16-color IBM® PC, and delivers the bright, sharp, clear, and stable screen image for which the entire NEC line has long been famous. Similar compatibility is available to

patibility is available to owners of Apple II®, Radio

Shack®, and Atari® computers, not to mention our own outstanding NEC PC-8000 series. Also available is a brand new, extremely low cost, NEC green monochrome monitor, the JB1260, perfect companion for an Osborne®, for instance.

Ask your dealer for a demonstration. Or write us at 1401 Estes Avenue, Elk Grove Village, IL 60007.

Productivity at your fingertips™

NEC

NEC Home Electronics (U.S.A.), Inc. Personal Computer Division

Nippon Electric Co., Ltd., Tokyo, Japan Circle 294 on inquiry card.

ERG/68000

MINI-SYSTEMS

☐ Full IEEE 696/S100

compatibility

HARDWARE OPTIONS

- ☐ 8MHz, 10MHz or 12MHz 68000 CPU
- ☐ Memory Management
- ☐ Multiple Port Intelligent I/O
- ☐ 64K or 128K STATIC RAM (70 nsec)
- 256K Dynamic RAM, with full parity (150 nsec)
- ☐ 8" D/D, D/S floppy disk drives
- ☐ 5MB-40MB hard disk drives
- ☐ Full DMA host adaptor
- ☐ 20MB tape streamer
- □ 10 to 20 slot backplane
- ☐ 30 amp power supply

SOFTWARE OPTIONS

- 68KFORTH¹ systems language with MACRO assembler and META compiler
- ☐ Fast Floating Point package
- ☐ Motorola's MACSBUG
- □ IDRIS² operating system with C, PASCAL, FORTRAN 77, 68K-BASIC¹ compilers
- ☐ CP/M—68K³ O/S with C, Assembler, 68K¹-BASIC, +68K¹-FORTH

Trademark ERG, Inc.

²Whitesmiths

³Digital Research

30 day delivery with valid Purchase Order

OEM prices available
For CPU, Integrated Card Sets
or Systems.



Empirical Research Group, Inc. P.O. Box 1176 Milton, WA 98354 206-631-4855

PIN	EIA	ССІТТ	Signal	Source
1	AA	101	Protective Ground	
7	AB	102	Signal Ground	
2 4 20 23 24	BA CA CD CH DA	103 105 108.2 111	Transmitted Data Request To Send Data Terminal Ready Data Signaling Rate Selector (DTE source) Transmitter Signal Element Timing (DTE source)	DTE (computer interface)
14	SBA	118	Secondary Transmitted Data	
19	SCA	120	Secondary Request To Send	
3 5 6 22 8 21 23 15	BB CB CC CE CF CG CI DB	104 106 107 125 109 110 112 114 115	Received Data Clear To Send Data Set Ready Ring Indicator Received Line Signal Detector Signal Quality Detector Data Signaling Rate Selector (DCE source) Transmitter Signal Element Timing (DCE source) Receiver Signal Element Timing (DCE source) Secondary Received Data	DCE (modem or terminal)
13	SCB	121	Secondary Clear To Send	
12	SCF	122	Secondary Received Line Signal Detector	

Table 2: RS-232C signals.

1976, it is obvious that the committee looks forward to the day when direct digital connection to a digital telephone network will be possible. Then all data transmission will be synchronous, and the communication equipment will provide bit and byte timing signals. X.21 includes the protocol for making and answering calls and for sending and receiving data using full-duplex synchronous transmission. Byte-timing signals are in fact an option, which the vast majority of digital telephone exchanges will almost certainly provide. In sharp contrast to RS-449. X.21 uses only six signals. The electrical specifications are in recommendations X.26 (corresponding to EIA RS-422A) and X.27 (EIA RS-423A).

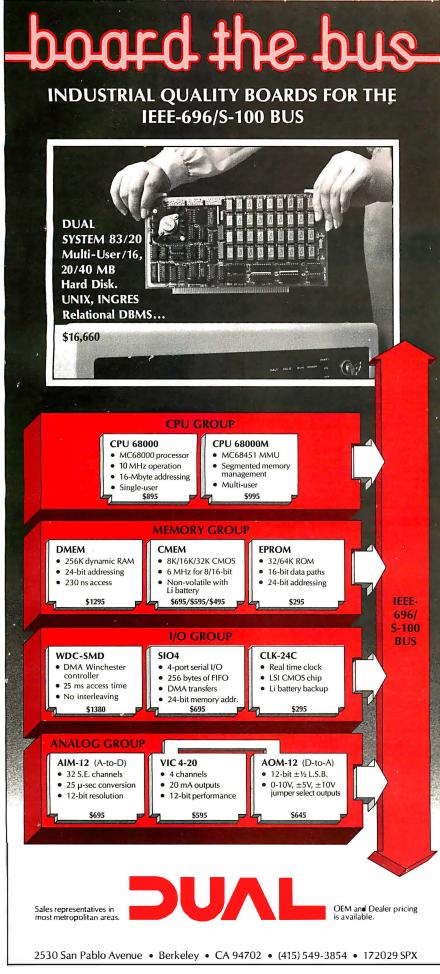
Although X.21 is defined as the lowest (or "physical") level of the international X.25 packet-switching protocol, it is far ahead of its time, for direct digital connection to public telephone networks is hardly possible now. For this reason, CCITT offers

the X.21 bis recommendation as an interim measure to connect existing computer equipment to packet communication services. With this, the wheel turns full circle, for this recommendation is essentially the same as RS-232C (V.24), and sadly, its use is almost universal in packet-switching protocol today.

I have, in the tradition of all great guides, followed a circular path. To create a more detailed path through this standards jungle, let's look closer at each of the standards I have mentioned.

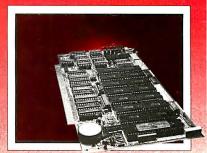
The RS-232C Standard

The 21 signals in RS-232C are numbered according to three systems: pin numbering used in the conventional 25-pin connector, the EIA RS-232C numbering, and the CCITT V.24 numbering (see table 2). I will explain each of the signals by providing a variety of different applications of the standard, each using progressively more signals.



THE ULTIMATE IEEE/S-100 MEMORY WOULD...

- **BE NONVOLATILE,** holding data for up to eight years with the power off.
- **RUN AT 6MHZ** without wait states.
- HAVE EXTENDED 24-BIT ADDRESSING and bank select.
- HAVE DYNAMICALLY
 MOVABLE WRITE PROTECT
 AREAS to prevent accidental
 erasure of programs and
 critical data
- ☐ GENERATE POWER-FAIL interrupts for orderly system shutdown & power failure recovery.



CMEM

AVAILABLE NOW FROM DUAL SYSTEMS, the CMEM memory boards combine high-speed CMOS memories with a new 5-8 year lithium battery. The CMEM offers the nonvolatility of an EPROM board while retaining the instant writability of a high-speed read/write RAM. These industrial grade boards are subjected to a 168-hour burn-in and a 1000-cycle power interruption test to insure data retention and the highest degree of reliability possible.

CMEM-32K, 32K Bytes \$695 CMEM-16K, 16K Bytes \$595 CMEM- 8K, 8K Bytes \$495



DUAL SYSTEMS CORPORATION

2530 San Pablo Avenue • Berkeley CA 94702 • (415) 549-3854 • 172029 SPX

Circle 153 on Inquiry card. BYTE February 1983 155

OUR PRICES, SELECTION AND SAME-DAY SHIPPING MAKE US COMPETITIVE.

Red Baron. Home of the Nation's

NEC 8023

Outstanding Graphics, Print Quality & Performance



144 x 160 dots/inch · Proportional spacing Lower case descenders • N x 9 dot matrix - 8 character sizes • 5 unique alphabets • Greek character set • Graphic symbols • 100 CPS print speed • Bi-directional, logic-seeking • Adjustable tractors • Single-sheet friction feed • Vertical & horizontal tabbing

NEC 8023 Dot MatrixList \$795

IDS Prism 80/132

Affordable Color, Speed



200 CPS • Bi-directional, logic-seeking • 24 x 9 dot matrix • Lowercase descenders • 8 character sizes • 80-132 columns • Proportional spacing · Text justification · Optional color and dot resolution graphics

Prism 80 Base List \$1,299 Prism 132 Base List \$1,499

SCall

The Epson Series

High-Quality Printers at a Low Price.



Epson MX-80FT List \$745 Epson MX-100 List \$995

Full Line of Epson Accessories

Smith-Corona TP-1

Daisy Wheel Printer For Under \$900

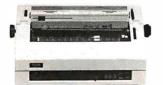


Letter quality • Standard serial or parallel data interface • Drop-in ribbon • 144 WPM • Various fonts available • Loads paper like typewriter · Handles single sheets for forms

Smith-Corona TP-1....List \$895

Brothers HR-1 Daisy Wheel

Perfect for quality. quiet word processing.



- •16 CPS Prints up to 6 copies Bi-directional
- Cloth or carbon quick-change cassette ribbon
 Quiet, efficient operation for word processing

Brothers HR-1

Parallel List \$1,100 Serial List \$1,200

SCall

NEC Spinwriter 7700 & 3500

Daisy Wheel Quality Leader



High speed, letter quality • 55/33 CPS • Typewriter quality • Bi-directional printing & proportional spacing • Quiet • OCR quality print • Hi-res_ plotting/graphing • Quick change ribbon • Optional cut-sheet feeder, horizontal or bi-directional tractors • Prints up to 8 copies

NEC Spinwriter RO Serial Parallel 7700. List \$3055

\$2500 \$1700 Serial 3510 List \$1895

Anadex Silent Scribe

The Quiet Serial Matrix Impact Printer



Up to 500 CPS · Dot addressable graphics Parallel and serial interfaces standard • Switch selectable protocol • Cartridge ribbon • Foreign character sets • Underlining • 1.5k to 12k buffer • Correspondence quality print

Discount

\$1300

Anadex DP-9501A \$ 1,725 Anadex DP-9620A \$1,845 Anadex WP-6000 \$3,250

Televideo CRT's

Price, Performance & Reliability



Discount .\$ 699 \$575 \$730 925\$ 995 \$945 950 \$1195 970 \$1495

Monitors

Crisp, Clear, Compatible



Amdek Video 300, green. List \$249

SCall for low prices

OUR PEOPLE MAKE US EXPERTS.

Largest Computer Printer Inventory.

The Grappler+™

Apple® Graphics Interface



· Graphic and text screen dumps · Dual Hi-Res Graphics • Printer Selector Dip Switch • Apple III compatible • Inverse Graphics • Emphasized Graphics • Double Size Picture • 90° Rotation • Center Graphics · Works with Pascal and CPM® · Optional Bufferboard Available

Grappler +....
*Requires software driver
Apple is a registered Trademark of Apple, Inc.

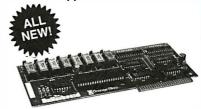


Customer Benefit Package

1. Free Expert Consultation, 2, Technical Staff. Even your most involved questions get quick, helpful answers from our staff of printer technicians. 3. Free Catalog. Get your informative catalog with printer comparison chart and print samples today. 4. Warranty. The manufacturer's warranty where applicable. 5. Same-Day Shipping. 6. Free MasterCard and Visa. 7. We Stock What We Sell. We make every effort to keep a large stock of our advertised products. 8. APO/FPO Orders Welcome.

The Bufferboard™

For Apples and Printers



Take your existing printer interface—and buffer it!

Versions for Grappler + , Apple interface, Epson interface, and others • Comes standard with 16K buffer • Expandable to 32K and 64K • Includes interface docking cable

IDS Microprism 480

Prints like a daisy. priced like a matrix!



Correspondence Quality in a Single Pass
Dual Speed 75, 110cps
Proportional Spacing · Bi-directional, logic-seeking · Platen Pin or pressure feed • 24 x 9 dot matrix • 10, 12, 16.8 Characters per inch • Doublewidth Characters

iDS Microprism 480 List \$799

The Okidata Series

Hi-Res or TRS 80 Block Graphics



120/200 CPS • 9 x 9 Matrix • Bi-directional, logicseeking printing • Lower case descenders • Four print styles • Optional Hi-Res Graphics

Okidata 82A List \$649 Okidata 83A (w/Tractor) .List \$995 Okidata 84 (Parallel) . . .List \$1395

Interface Equipment

Complete Stock of Options, Cables and Accessories

CCS APPLE SERIAL Interface & Cable\$150
SIGNALMAN MODEM\$Call
COMPLETE STOCK OF EPSON
ACCESSORIES\$Call
CUSTOM PRINTER CABLES FOR
Apple, Atari, IBM, TRS-80 (all models)\$Call
HAYES MICROMODEM II \$300
PRINTER STANDS: Large\$ 99
Small\$ 25
PRINTER RIBBONS—Most Types \$Call

Here's How To Order:

Phone orders are welcome; same-day shipment on orders placed before 11:00 a.m. Free use of MasterCard and Visa. COD's accepted. Personal checks require 2 weeks clearance. Manufacturer's warrantv included on all equipment. Prices subject to revision.

Call For Free Catalog:

(800) 854-8275

CA, AK, HI (714) 779-2779









Circle 369 on Inquiry card.

4501 E. Eisenhower Circle, Anaheim, CA 92807

Video Display Terminal—signals used: Protective Ground. Signal Ground, Transmitted Data, and Received Data. The Protective Ground is for safety and connects to the equipment chassis at both ends of the link. The Signal Ground establishes a common ground reference voltage for all data signals. Transmitted Data is the data path from the computer interface to the terminal, while Received Data is the path in the reverse direction. You don't need any other connections for a simple asynchronous RS-232C-compatible terminal interface.

Serial Printer—signals used: Protective Ground, Signal Ground, Transmitted Data, and Data Set Ready. Because the data connection to the printer is only in one direction, you don't need the Received Data line. However, most printers cannot accept characters continuously at an even rate. For example, a daisy-wheel letter-quality printer takes a significant time to move the print head from one position to another, and so the

printing rate depends on character spacing. A Return character generally takes longer than other characters because in most cases the print head has to move farther across the paper than for other characters. This presents the problem of flow control; the printer must provide feedback to the computer interface to control the data flow. The Data Set Ready line is one way to provide the feedback.

You can use the ASCII control codes DC1 and DC4 to regulate data flow to a serial printer.

Actually, Data Set Ready has other purposes. A modem uses it to indicate that its power is on and that the modem is ready to receive data for transmission. Many software device drivers examine this signal before transmitting each output character and simply delay transmission until it is in the on state. Therefore, you can

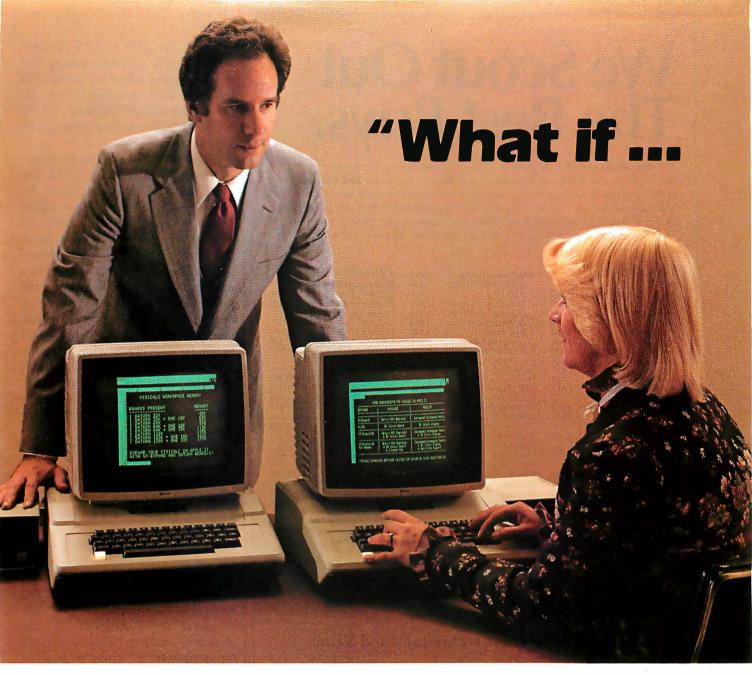
use the signal for flow control, even though it was not designed for that purpose. You can also use other lines, such as Clear To Send, for the same purpose.

Another technique for regulating data flow to a device like a serial printer is to use the ASCII (American National Standard Code for Information Interchange) control codes DC1 (device control 1, often called XON) and DC4 (often called XOFF). These codes correspond to the control characters Control-Q and Control-S respectively. Some software device drivers use them to suspend and resume output to a terminal. When you use these codes for flow control on a printer, you connect the Received Data line rather than the Data Set Ready line. The printer then transmits Control-S when its buffer is full and Control-O when it is ready for more data.

Many printer manufacturers cater to both flow-control methods. However, in practice, significant problems can arise with each of them. When the printer is connected through a modem, there is no connection between the states of the Data Set Ready lines at the two ends of the link, and so you can't use the first method, which is meant for purely local use. The XON/XOFF protocol should work fine over a telephone connection, provided the operating system you use responds quickly to the XOFF control character. While a few extra characters don't usually matter on a video display terminal, they can mean a disastrous buffer overflow for a printer. The same result may occur due to characteristics of a terminal multiplexer, which in many cases has internal character buffers that store several characters awaiting transmission. When XOFF arrives, the data to the printer will not cease immediately, even if the operating system instantly stops sending characters. In another case, if you connect your printer to the printer port provided on some terminals, you may again see a delay in the execution of the XOFF command due to the buffering going on in that

Remember that RS-232C was never





I run out of memory?"

Most people do run out of memory with only 18K VisiCalc* workspace. But you can expand your Apple II* to 177K VisiCalc memory! You can also get 80-column display, lower case letters, and hard disk



support—all without buying a bigger computer.

The Saturn expansion system for VisiCalc consists of a preboot diskette, one or more plug-in RAM boards, and an optional 80-column display board. You can put the Saturn boards in any slot. And with all that memory, our software lets you save files on more than one diskette.

Each Saturn RAM board includes additional software for other programming applications. So your BASIC, PASCAL, and CP/M programs get an extra bonus.

Ask your computer dealer for more details about the Saturn memory expansion systems. See how much bigger and better your models can become!

*VisiCalc is a registered trademark of VisiCorp. Apple II is a registered trademark of Apple Computers, Inc.

SATURN SYSTEMS INC.

P.O. Box 8050 3990 Varsity Drive Ann Arbor, MI 48107

1 (313) 973-8422

Circle 377 on inquiry card.

We Scout Out The Best Buys.

THE PURCHASING AGENT is your computer buying company. We negotiate the purchase of millions of dollars of hardware **and software** at the best prices each year. Our buying power gives you more hardware and software for your money. Our fee is 25% of what we save you off list price. By participating in the savings, we share a common goal — to save you money.

Call us for your price on any product not listed. All prices shown include our fee

COMPUTERS		IBM Personal comp.	CALL	PRINTERS	
		Amdek Color III term.	430	Brother, parallel, daisy	910
Alpha Micro 1000 VV	V \$5,960	AST	CALL	C Itoh, F-10, daisy	1.350
Alpha Micro 1030	12,047	Baby Blue	CALL	Daisywriter 2000	1,120
Alpha Micro 1051	17,634	Davong 5 meg. H.D.	1,575	Diablo 620, daisy	
Alspa AC1-2/SS	2,320	Diablo 630 API	1,825	25 cps	1,195
Altos 8000-10	5,850	NEC 3550	1,920	Diablo 6.30, daisy	2,050
Altos 8600-10	7,586	Seattle boards	CALL	IDS Prism 132 options	1,430
Altos Series 5-15D	2,100	& all IBM peripherals	CALL	NEC 3510	CALL
Altos Series 5-5D	4,195	Micromation	CALL	NEC 7710 R/O	2,325
Apple Computers	CALL	Molecular	CALL	NEC/Sellum 1, 16K,	
Associate	CALL	Morrow Micro Decisions	CALL	tractor	2,595
Burroughs	CALL	NEC 16 bit APC system	CALL	Qume 9/45 full panel	1,865
California Computer		NEC 8000 64K PC sys.	2,266	Qume 9/55 full panel	2,180
Systems 300-1A	4,414	NorthStar Advantage	2,625	Smith Corona TP-1, daisy	681
Columbia Data	CALL	NorthStar Adv. H.D. 5	4,395	Tally	CALL
Compupro Godbout ¹	M	Onyx 5001 MU-6	7,350	Texas Instr. TI 810	1,240
Sys. 816/A*	4,200	Onyx 8000 MU-10	7,900	OTHER REPUBLIE	ALC
Sys. 816/B*	5,360	Osborne	CALL	OTHER PERIPHER	
Sys 816/C*	6,880	Sanyo 1000	1,540	Amdek Color II term.	694
*Assembled and te	ested	Seattle System 2	3,251	Ventel 212+ modem	765
Cromemco System 1	2,946	Televideo TS-802	2,600	Corvus 10 meg. H.D.	2,995
Cromemco System 2	3,400	Televideo TS-802H	4,450	Houston Instr. DMP-29	1,549
Cromemco 68000		Televideo TS-806	5,200	Houston Instr. DMP-40	775
System 1	4,395	Vector 2600	3,895	Morrow 20 meg. H.D.	3,650
Dynabyte	26% OFF	Vector 3005	5,495	COETIMARE	
Eagle II	2,350	Vector 4	CALL	SOFTWARE	
Eagle 1600	5,420	Victor	CALL	Call for prices on all ye	our
Foson Computer	CALL	Zenith 100	CALL	software needs.	

Mastercard, VISA at 3% handling fee. Prices subject to change without notice. Minimum fee \$150.

EXPORT SERVICES AVAILABLE.

COMPLITEDO

We are agents for overseas computer dealers and disbributors INTERNATIONAL TELEX 470851

On The Frontier of High Technology and Value.

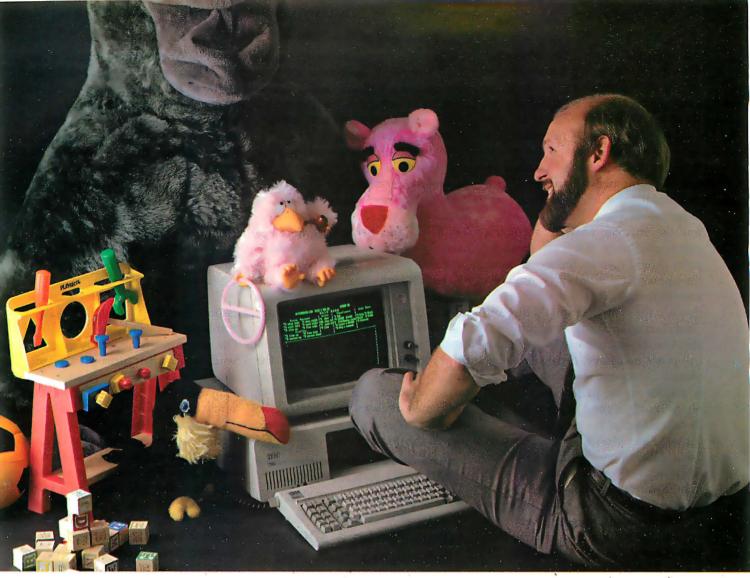


intended for DTE-to-DTE connections. Thus it is not surprising that problems arise when the standard is used for such purposes. After all, these flow-control methods are ad hoc mechanisms tacked on to an unsuitable standard.

Full-Duplex Private-Line Modem signals used: Protective Ground, Signal Ground, Transmitted Data, Received Data, Received Line Signal Detector, and (possibly) Data Set Ready. The Received Line Signal Detector, often called Carrier Detect, says in effect, "I hear something like a modem talking to me." You use this signal to tell the computer that someone is trying to make contact on that line. You could use it to trigger the computer to generate a log-on invitation. Data Set Ready may indicate that the modem is ready and not in voice or test mode, but this is not a common practice in North American asynchronous modems.

Half-Duplex Private-Line Modem signals used: Protective Ground, Signal Ground, Transmitted Data, Received Data, Request To Send, Clear To Send, Received Line Signal Detector, and (possibly) Data Set Ready. Request To Send and Clear To Send control the transmission direction in the half-duplex operation. The computer generates Request To Send when it wants to transmit. The Clear To Send signal indicates that the modem is ready to receive characters for transmitting. There will be a delay-typically 200 milliseconds (ms)—between the Request To Send signal from the computer and the Clear To Send handshake, because the modem must generate the carrier waveform and allow it to stabilize. When the transmission finishes, the computer drops Request To Send, causing the modem to turn the transmitter off. To ensure that both ends of the link cooperate in choosing the direction of the transmission, you need a software protocol.

Switched Network Auto-Answer Modem—signals used: Protective Ground, Signal Ground, Transmitted Data, Received Data, Request To Send, Clear To Send, Data Terminal Ready, Ring Indicator, Received Line Signal Detector, and (possibly) Data



This Programming professional deserves a lot more from his personal computer.

He's earned it. As a seasoned professional, he's learned to master some of the world's most advanced programming tools. Tools specially designed to meet the everyday demands of programming experts.

But as the owner of a personal computer, he's come to expect less. Less performance. Less sophistication. And less flexibility.

Why should programming a personal computer be any different?

Prior to the announcement of micro/ SPF™ development software, experienced programmers felt programming a personal computer was a lot like playing with a toy. You couldn't take it seriously.

But today, there's micro/SPF,[™] a solution to elementary program editing tools now offered with most micro-computers.

With micro/SPF™ you get the same procedures and commands experienced programmers are accustomed to using at work. By mimicking features found in

standard SPF software, micro/SPF™ provides all the sophisticated utilities programming professionals expect.

Programming experts can take advantage of skills they've spent years perfecting.

Now, for the first time, mainframe software is available for personal computers. SPF screens are fully reproduced in logical sequence and each screen is formatted identical to those found in the SPF system.

In addition, micro/SPF™ comes equipped with the same primary and line commands, tutorial messages and program editor (with program function keys) experienced programmers are used to.

Programming professionals who've spent years perfecting the art of writing sophisticated code deserve to work with state-of-the-art tools, not toys. Find out how micro/SPF™ can help you do work-compatible programming on your personal computer today!

```
SELECT OFFICE ==== MICRO/SPF PRIMARY OFFICE NEW SERIO ```

## **PHASER**

PHASER SYSTEMS, INC 50 WEST BROKAW ROAD SAN JOSE, CA 95110

Circle 336 on inquiry card.

BYTE February 1983 161

Set Ready. Here, the additional signals are Data Terminal Ready, which shows that the computer is ready to receive calls, and Ring Indicator, which signals that the modem has received a new call. The Ring Indicator signal goes up and down as the telephone bell rings so that the computer can answer after a specified number of rings. If the computer leaves Data Terminal Ready on, the modem answers incoming calls immediately. If it is off, the computer should turn on the signal, after the appropriate number of rings, to answer the call. At the completion of the call, the computer should turn off Data Terminal Ready to ensure that the line is disconnected. Normally this is not necessary, because the line should disconnect automatically when the calling party hangs up the phone, but it is good practice to force disconnection at both ends.

Dual-Rate Modems—extra signals used: Data Signaling Rate Selector (DTE source) and Data Signaling Rate Selector (DCE source). Some modems allow switching between two transmission speeds. These two signals control whether the modem uses the high or low speed. Usually the modem at the calling end sets the speed for the connection. In this case, the calling computer uses the Data Signaling Rate Selector (DTE source) to determine the line speed. The calling modem signals the speed to the answering modem, which informs the called computer by setting Data Signaling Rate Selector (DCE source) appropriately.

Synchronous Modems—Extra signals used: Signal Quality Detector, Transmitter Signal Element Timing (DTE source), Transmitter Signal Element Timing (DCE source), and Receiver Signal Element Timing (DCE source). Synchronous modems provide a clock signal along with the data. In the case of received data, the modem provides the Receiver Signal Element Timing (DCE source) or the clock. For transmitted data, the modem may still provide the clock signal on Transmitter Signal Element Timing (DCE source). Or the computer equipment (DTE) may generate timing signal instead, called Transmitter Signal Element Timing (DTE source). Synchronous modems also provide a signal which shows whether or not there is a high probability of an error in the received data (Signal Quality Detector).

Modems with Primary and Secondary Channels—extra signals used: Secondary Transmitted Data, Secondary Received Data, Secondary Request To Send, Secondary Clear To Send, and Secondary Received Line Signal Detector. Some modems provide a primary transmission channel with a high data rate (e.g., 1200 bps) and a secondary channel in the reverse direction with a much lower data rate (e.g., 75 bps). The reverse channel allows you to listen and confirm reception or to interrupt the transmitter. The channel directions can be reversed, and the above set of five signals allows you to control the secondary channel in much the same way as the primary one.

# Do you know what happens when you make a call to a computer on a 300-bps full-duplex switched line?

### A Scenario

The following sequence of events, illustrated in table 3, will show you what happens when you make a call to a computer on a 300-bps fullduplex switched line. To begin, the computer expects a call and so it leaves Data Terminal Ready on, which in turn sets the computer's modem ready to answer a call as soon as one is received. When this happens, the computer sees Ring Indicator (which it can ignore because Data Terminal Ready is already on) and Data Set Ready (the signal for the computer to generate Request To Send). In the preceding section, I explained Request To Send and Clear To Send in the context of half-duplex calls. In fact, full-duplex modems use them also. Request To Send commands the modem to turn on its transmitter. After a short delay, the computer sees Clear To Send and ignores it. At the other end of the line, you hear the carrier signal and either push the data button (on a data set) or put the telephone handset onto the acoustic coupler. Now your modem's transmitter turns on, producing its own carrier whistle. When the modem at the computer end hears this, it turns on Received Line Signal Detector. Upon receiving this signal, the computer begins sending data. Many operating systems, however, ignore this signal and simply wait for you to send a character to begin the log-on process.

At the end of the transmission, assume that the computer decides to terminate because you logged off. The computer turns off Request To Send, which then turns off the computer's modem carrier signal. The computer then turns off Data Terminal Ready, forcing the line to be disconnected. Meanwhile, in your modem, Received Line Signal Detector goes off and generates a warning note to you. You replace the handset, ensuring that the line disconnects from your end also. When the computer sees its Received Line Signal Detector turn off, it knows that the disconnection is complete, and so raises Data Terminal Ready in preparation for the next call.

## RS-232C and RS-449: What's the Difference?

RS-232C is being superseded by a new standard, RS-449. Technically, the major differences between them result from RS-449's using improved electrical-transmission standards. To explain these improvements, I will first describe the electrical specifications of RS-232C.

An RS-232C transmitter generates a voltage of above +5 volts (V) to signal one line condition, called Space, and a voltage of below -5 V to signal the other condition, called Mark. To produce these voltages, you generally use a power supply of ±12 V. A receiver recognizes voltages of above +3 V as Spaces and voltages of below -3 V as Marks (see figure 1). When a signal changes from one condition to the other, it can spend, at most, 4 percent of a bit period (the duration of a bit: 2

# Scratchpad

# The Ultimate Spreadsheet for CP/M-86, IBM PC DOS, and CP/M®

## The Ultimate Spreadsheet? YOU BET!

Packed with more important features and performance than any other spreadsheet, ScratchPad is perfect for "what if" analyses and financial modeling of all kinds.

The features tell the story:

## Flexible Spreadsheet

A ScratchPad innovation. Now you can design the spreadsheet to fit your application, rather than redesigning your application to fit the spreadsheet. For example, if you need a worksheet that is extremely wide but not very deep, ScratchPad can do it. The matrix dimensions are up to you.

## Virtual Memory

Another ScratchPad innovation. When your computer runs out of memory in RAM, your disk drives act as backup memory for additional spreadsheet data. (This is something the VisiCalc and SuperCalc people don't talk about in their ads. They can still run out of memory!)

ScratchPad with a hard disk on the IBM PC, for example, allows in excess of 20,000 entries! NEVER see those disastrous OUT OF MEMORY messages again.

## **Consolidation**

This lets you combine several spreadsheets, adding or averaging the numeric data. It is especially useful to businesses that want to combine data from several departments, or add or average spreadsheets from different months or years. Just another reason why ScratchPad is the ultimate spreadsheet.

Circle 398 on Inquiry card.

These features and many others make ScratchPad the most powerful spreadsheet available! So, find out why we call ScratchPad the Ultimate Spreadsheet.

Write: ScratchPad Information, SuperSoft, Box 1628, Champaign, IL 61820.

## This is what others are saying:

Small Business Computers, July/August '82 "In our opinion ScratchPad is an excellent business-oriented spreadsheet program, easy to learn, easy to use, and well documented."

InfoWorld, Sept. 6, '82

"ScratchPad...(is designed) for users who want entry simplicity and fast answers."

Business Computer Systems, Sept. '82 "...a new memory innovation from SuperSoft...ScratchPad('s) virtual memory can accomodate an essentially unlimited number of entries by tapping the disk drive for secondary memory."

Available for IBM PC DOS, CP/M-86 and CP/M. ScratchPad: \$295.00 (Requires 96K with PC DOS, 64K with CP/M-86, and 56K with CP/M)\*

Japanese Distributor: ASR Corporation International, 3-23-8, Nishi-Shimbashi, Minato-Ku, Tokyo 105, Japan. Tel. (03)-4375371 Telex: 0242-2723.

European Distributor: Micro Technology Ltd., 51 The Pantiles, Tunbridge Wells, Kent, England TN2 5TH. TEL. 0892-45433. Telex: 95441 Micro-G.

\*Additional memory recommended for optimal performance of all features.

IBM Personal Computer is a trademark of International Business Machine Corp.

CP/M and CP/M-86 are registered trademarks of Digital Research. VisiCalc is a registered trademark of VisiCorp. SuperCalc is a registered trademark of Sorcim.



| Terminal                                                                                                 | Line                     | Computer                                                                                        |
|----------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------|
|                                                                                                          |                          | Data Terminal Ready is on in anticipation of a call                                             |
| raise handset and dial                                                                                   |                          |                                                                                                 |
|                                                                                                          | connect call             |                                                                                                 |
|                                                                                                          |                          | see Ring Indicator and Data<br>Set Ready, generate Request<br>To Send                           |
|                                                                                                          | carrier whistle          |                                                                                                 |
| hear carrier (analogous to<br>Received Line Signal<br>Detector)                                          |                          | (after short delay, see Clear<br>To Send)                                                       |
| push data button (see<br>Data Set Ready light)                                                           | carrier signal           |                                                                                                 |
|                                                                                                          |                          | see Received Line Signal<br>Detector                                                            |
|                                                                                                          | —carry on communication— | _                                                                                               |
|                                                                                                          |                          | set Request To Send off                                                                         |
|                                                                                                          | no tone from computer    |                                                                                                 |
| modem's Received Line<br>Signal Detector goes off,<br>modem generates warn-<br>ing note, replace handset |                          | set Data Terminal Ready<br>off, Clear To Send and<br>Data Set Ready go off                      |
|                                                                                                          | call disconnected        | Received Line Signal Detector goes off, set Data Terminal Ready on in preparation for next call |

**Table 3:** The sequence of events in a 300-bps dialed call, proceeding from top to bottom.

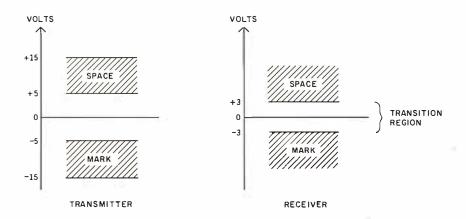


Figure 1: RS-232C signal levels.

microseconds at the maximum speed of 19,200 bps) in the transition region. This requirement limits the amount of stray capacitance allowable in the transmission link because capacitance smooths out sharp transitions. RS-232C specifies that the capacitance must not exceed 2500 picofarads (pF); and, because ordinary cables have a capacitance of 40 or 50 pF per foot, RS-232C limits cables to 50 feet.

A second difficulty of RS-232C is its grounding arrangements with two separate lines: Protective Ground and Signal Ground. Unfortunately the standard does not state clearly how these signals are to be used. In many implementations, the Protective Ground is simply not connected.

Grounding for distributed analog systems is a notoriously difficult subject. To give you a simple idea of the problems that could occur, imagine an RS-232C link between two pieces of equipment where Protective Ground is not connected but where Signal Ground is connected to the earth at both ends (this is quite a common arrangement). Different ground potentials at the ends of the link cause a ground current to flow through the Signal Ground wire. The inevitable resistance in this wire insures that a potential difference between the Signal Grounds exists that could, if large enough, cause the data to be received incorrectly.

The obvious way to overcome ground potential differences between the transmitter and the receiver is to send the signal differentially on two wires. The difference between the voltages on the wires determines whether a Mark or a Space is read. This is how RS-422A works, and you may recall that this technique is known as balanced transmission. Figure 2 shows an RS-422A signal, carried on a twisted pair of wires. A balanced transmission would use two of these signals.

Of course, you can regard even RS-232C as transmitting a signal differentially, with the difference being between the signal-wire voltage and the ground-wire voltage. What makes this approach inferior is that the ground wire actually connects to the



The original Grappler was the first graphics interface to give you hi-res screen dumps from your keyboard. The new Grappler + with Dual Hi-Res Graphics adds flexibility with a side-by-side graphics printout of page 1 and page 2.

The Grappler + can now be used with the Apple® Dot Matrix, the Okidata 84, and is Apple III compatible." In addition, the IDS Grappler + is currently available with color capability, including color graphics screen dumps.

The imitations are many, so insist on the #1 Apple graphics interface on the market. Insist on the Grappler + . Available now at most Apple dealers.

- Requires additional software driver.
- \*Requires graphics upgrade.

Circle 309 on inquiry card.

© Orange Micro, Inc. 1982





CPM is a registered trademark of Digital Research, Inc. Apple is a registered trademark of Apple Computer, Inc.

Selector Dip Switch • Apple III Compatible\* • Graphics Screen Dump • Inverse Graphics • **Emphasized Graphics • Double Size** Picture • 90° Rotation • Center **Graphics • Chart Recorder Mode •** Block Graphics • Bell Control • Skip-over-perf • Left and Right

Margins • Variable Line Length • Text Screen Dumps.

The Grappler + also works with Pascal and CPM.

## The Grappler + interfaces with

the following printers: Anadex · Apple Dot Matrix · Centronics 122 · C. Itoh ProWriter ·

Epson MX-70, MX-80\*\* MX-80F/T\*\*, MX-100 · IDS 460, 560, Prism 80 and 132, Microprism ·

NEC 8023 • Okidata 82A \* \*,83A \* \*, 84. Orange Micro

1400 N. Lakeview, Anaheim, CA 92807 U.S.A. (714) 779-2772 Telex: 183511 CSMA Foreign Dealer Inquiries Welcome

# IBM personal computer UCSD p-System™ Version IV.1

## NCI now offers Version IV.1 which includes:

- RAMdisk
- Subsidiary Volume Support
- 8087 Numeric Coprocessor Support
- FASTER Long Integers (2x)
- FASTER Floating Point (3x)
- 25% greater floppy storage
- Floppy Write Verification
- Asynchronous Serial I/O
- Extended memory codepool
- 8086/87/88 Macro Assembler
- 8087 Native Code Generator
- program caller unit
- generalized sort unit
- 32 bit seek
- FASTER Seek
- FASTER Turtlegraphics
- Adaptable Support
- PC DOS Filer Utility
- Background Spooler

## Also available

- PFAS Pascal File Access System
- Hard Disk Support
- Advanced Systems Editor
- Sprinter text formatter
- QuickISAM/PascalISAM/SuperDB
- OuickForm/PascalForm

## Available for

- IBM pc
- Victor 9000

TM Regents University California TM IBM Corporation

For more information call

Network Consulting Inc.
Discovery Park
Suite 110-3700 Gilmore Way
Burnaby, B.C. Canada V5G 4M1
604-430-3466

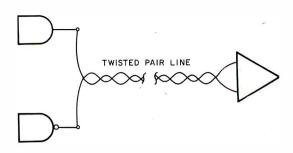


Figure 2: An RS-422A signal.

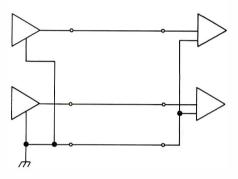


Figure 3: Two RS-423A signals.

ground at each end. Then if the ground potentials differ, the ground wire carries a substantial current. The amount of the current depends on the ground-potential difference and the electrical resistance of the ground wire. This current makes the potential of the ground wire different at each end. The RS-422A grounding reguirements are much less critical than those of the RS-232C because the standard does not use ground as a voltage reference. Therefore, the use of the Signal Ground wire, which connects the grounds at each end of the link, is optional.

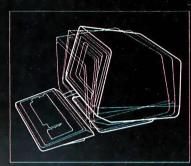
The third major difference between RS-422A and RS-232C is the transition region between Mark and Space states. This is only 400 millivolts (mV) in RS-422A, whereas it is 6 V in RS-232C. With the elimination of the ground-potential problem, the use of such a narrow region becomes possible. If the difference signal between the two wires is positive and more than 200 mV, the receiver reads a Mark, while if it is negative and more

than 200 mV, the receiver reads a Space. This approach allows suitable transmitters and receivers to be implemented with just the normal  $\pm 5$ -V power supply.

Because of the much smaller transition region, RS-422A transmitters will not drive RS-232C receivers correctly. This incompatability poses such a serious disadvantage that the EIA introduced the RS-423A standard, which you can use with both RS-449 and RS-232C. This standard is not just an interim measure. however, for RS-423A does not use two wires for each signal as RS-422A does and thus is more economical. You can see two RS-423A signals in figure 3. Each direction uses a common return path that connects to ground at one end of the link only, the transmitter end. The receiver judges whether a Mark or Space is present by examining whether the signal wire is negative or positive with respect to the common return. Because this return path does not connect to ground in the receiver, the

# VISUAL presents ergonomic elegance and high performance in a low-cost terminal.





Tilt: 10° forward, 15° backward



Swivel: 270°

The VISUAL 50 represents a new approach in low cost terminals. Although it costs drastically less, it offers the features you expect from the high priced units.

For example, the VISUAL 50 enclosure is ergonomically designed in light weight plastic and can easily be swiveled and tilted for maximum operator comfort. A detached keyboard, smooth scroll, large  $7 \times 9$  dot matrix characters and non-glare screen are a few of the many human engineering features normally offered only on much higher priced terminals.

Another distinctive feature of the VISUAL 50 is its emulation capability. VISUAL 50 is code-for-code compatible with the Hazeltine Esprit, \*\* ADDS Viewpoint, \*\* Lear Siegler ADM-3A\*\* and DEC VT-52.\* Menu driven set-up modes in non-volatile memory allow easy selection of terminal parameters.

And you're not limited to mere emulation. As the chart shows, the VISUAL 50 has features and versatility the older, less powerful low cost terminals simply cannot match.

| FEATURE COMPARISON CHART        |              |                     |                   |                          |                   |  |  |
|---------------------------------|--------------|---------------------|-------------------|--------------------------|-------------------|--|--|
| FEATURE                         | VISUAL<br>50 | Hazeltine<br>Esprit | ADDS<br>Viewpoint | Lear<br>Siegier<br>ADM-5 | TeleVideo®<br>910 |  |  |
| Tilt and Swivel                 | YES          | NO                  | NO                | NO                       | NO                |  |  |
| Detached Keyboard               | YES          | NO                  | YES               | NO                       | NO                |  |  |
| N-Key Rollover                  | YES          | NO                  | YES               | NO                       | NO                |  |  |
| Audible Key Click               | YES          | YES                 | NO                | NO                       | NO                |  |  |
| Menu Set-Up Mode                | YES          | NO                  | NO                | NO                       | NO                |  |  |
| Status Line                     | YES          | NO                  | NO                | NO                       | NO                |  |  |
| Full 5 Attribute Selection      | YES          | NO                  | NO                | NO                       | YES               |  |  |
| Smooth Scroll                   | YES          | NO                  | NO                | NO                       | NO                |  |  |
| Line Drawing Character Set      | YES          | NO                  | NO                | NO                       | NO                |  |  |
| Block Mode                      | YES          | YES                 | NO                | NO                       | YES               |  |  |
| Insert/Delete Line              | YES          | YES                 | NO                | NO                       | YES               |  |  |
| Bi-Directional Aux Port         | YES          | YES                 | NO                | YES                      | NO                |  |  |
| Columnar Tabbing                | YES          | YES                 | NO                | NO                       | YES               |  |  |
| Independent RCV/TX Rates        | YES          | NO                  | NO                | NO                       | NO                |  |  |
| Answerback User<br>Programmable | YES          | NO                  | NO                | OPT.                     | NO                |  |  |



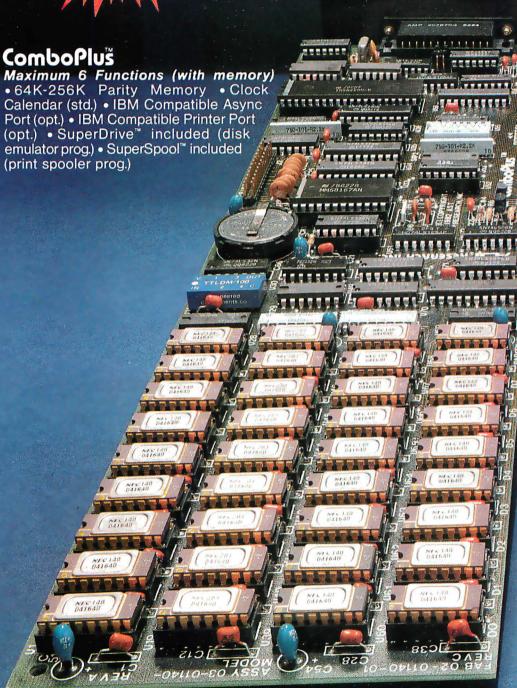
See for yourself

Visual Technology Incorporated 540 Main Street, Tewksbury, MA 01876 Telephone (617) 851-5000. Telex 951-539

Circle 428 on inquiry card.



# The Ultimate for the



MegaPak option to 512K

Serial #1

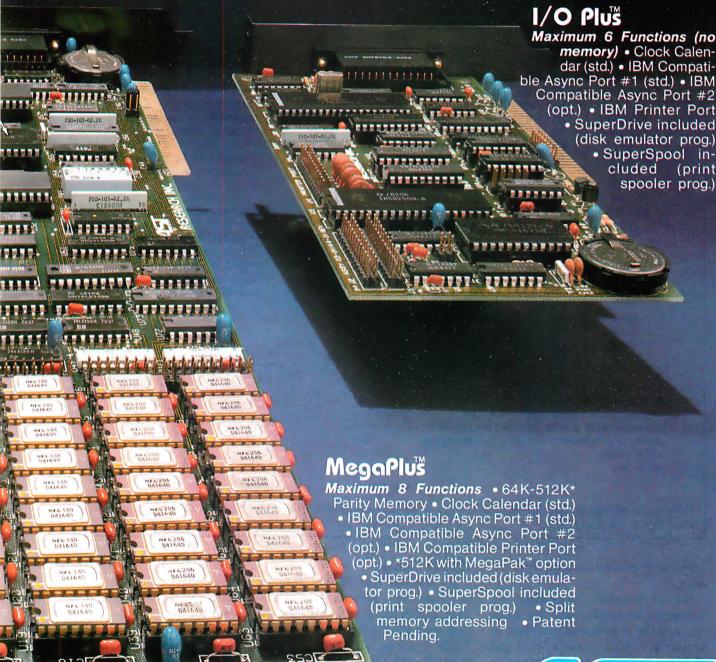
Printer

Serial #2

64K-256K Memory

Other products available for IBM PC: 1) 2780/3780 Bisync Emulation Package; 2) Advance Communication Card (Async, Bisync, SDLC, HDLC); 3) Expansion Parity Memory (64K-256K); 4) Disk++ (memory, Async & disk host adaptor); 5) Original Memory Combo; 6) Async Communication Card (1 or 2 ports); 7) Wire Wrap Card 13.1" x 4"); 8) Extender Card; 9) 327X Emulation. AST products are now available from your local Computerland stores and selected dealers throughout the U.S. IBM is the registered trademark of International Business Machines.

## Add-On Cards PC are Here!



Circle 3 on inquiry card.

WODEL MOSY 05-01158 RESERRCH INC.

2372 Morse Ave. Irvine, California 92714 Telephone: (714) 540-1333 **Dealer inquiries welcome.** 

| Pin           | Signal |                           |     |                                                |  |
|---------------|--------|---------------------------|-----|------------------------------------------------|--|
|               |        | RS-449                    |     | RS-232C                                        |  |
| 37/19 9/5     | SG     | Signal Ground             | AB  | Signal Ground                                  |  |
| 37/37 9/9     | SC     | Signal Common             |     | ·                                              |  |
| 37/20 9/6     | RC     | Receive Common            |     |                                                |  |
| 37/28         | IS     | Terminal In Service       |     |                                                |  |
| 37/15         | IC     | Incoming Call             | CE  | Ring Indicator                                 |  |
| * 37/12 37/30 | TR     | Terminal Ready            | CD  | Data Terminal Ready                            |  |
| * 37/11 37/29 | DM     | Data Mode                 | cc  | Data Set Ready                                 |  |
| * 37/4 37/22  | SD     | Send Data                 | BA  | Transmitted Data                               |  |
| * 37/6 37/24  | RD     | Receive Data              | BB  | Received Data                                  |  |
| * 37/17 37/35 | π      | Terminal Timing           | DA  | Transmitter Signal Element Timing (DTE source) |  |
| * 37/5 37/23  | ST     | Send Timing               | DB  | Transmitter Signal Element Timing (DCE source) |  |
| * 37/8 37/26  | RT     | Receive Timing            | DD  | Receiver Signal Element Timing                 |  |
| * 37/7 37/25  | RS     | Request To Send           | CA  | Request To Send                                |  |
| * 37/9 37/27  | CS     | Clear To Send             | СВ  | Clear To Send                                  |  |
| * 37/13 37/31 | RR     | Receiver Ready            | CF  | Received Line Signal Detector                  |  |
| 37/33         | SQ     | Signal Quality            | CG  | Signal Quality Detector                        |  |
| 37/34         | NS     | New Signal                |     |                                                |  |
| 37/16         | SF     | Select Frequency          |     |                                                |  |
| also 37/16    | SR     | Signaling Rate Selector   | CH  | Data Signal Rate Selector (DTE source)         |  |
| 37/2          | SI     | Signaling Rate Indicator  | CI  | Data Signal Rate Selector (DCE source)         |  |
| 9/3           | SSD    | Secondary Send Data       | SBA | Secondary Transmitted Data                     |  |
| 9/4           | SRD    | Secondary Receive Data    | SBB | Secondary Received Data                        |  |
| 9/7           | SRS    | Secondary Request To Send | SCA | Secondary Request To Send                      |  |
| 9/8           | SCS    | Secondary Clear To Send   | SCB | Secondary Clear To Send                        |  |
| 9/2           | SRR    | Secondary Receiver Ready  | SCF | Secondary Received Line Signal Detector        |  |
| 37/10         | LL     | Local Loopback            |     |                                                |  |
| 37/14         | RL     | Remote Loopback           |     |                                                |  |
| 37/18         | TM     | Test Mode                 |     |                                                |  |
| 37/32         | SS     | Select Standby            | 1   |                                                |  |
| 37/36         | SB     | Standby Indicator         |     |                                                |  |

| number of signals in list                      | 30             |
|------------------------------------------------|----------------|
| less number of signals which share a pin       | <b>– 1</b>     |
| number of extra pins for balanced-line signals | + 10           |
| duplicate grounds/commons (one for each cable) | + 3            |
| cable shields                                  | + 2            |
| spare pins                                     | +2             |
|                                                | total pins: 46 |

**Table 4:** RS-449 signals and their RS-232Cd analogs. Signals marked with an asterisk (\*) use RS-422A for higher-speed links; all other signals use RS-423A.

problem of ground currents does not arise.

For an RS-423A transmitter, the voltage difference between the signal line and the common return must be at least 4 V, positive for a Space and negative for a Mark. This gives an 8-V transition region—enough for RS-232C receivers—but also presents the same power-supply problem that occurs with the RS-232C. Because the RS-423A receiver must be as sensitive to the same 400-mV transition region as an RS-422A receiver is, you can use an RS-422A transmitter with an RS-423A receiver.

## RS-449 Signals

It's obvious that RS-449 provides few functional advantages over RS-232C except those stemming from the new electrical transmission methods. Table 4 shows all RS-449 signals, together with the corresponding RS-232C signals. Notice the similarity between the new and old standards. The major differences are in the grounding arrangements (Signal Common and Receive Common) and testing facilities. Apart from these, only a few miscellaneous signals have been added. All signals shown in the table use the RS-423A transmission stan-

dard except the 10 asterisked ones, which may optionally use the RS-422A for higher-speed links. (Two wires are specified for each of these.) The signals are divided between a 37-pin and a 9-pin connector, and the ground and common signals are transmitted separately for each cable. Many applications will not need the smaller cable, for it only contains signals relevant to the secondary channel.

## The Current-Loop Interface

Now that I have described the electrical specifications for RS-232C, it is

FREE purchase with software purchase

## DSGUNT SOFTWARE

| / | = Ne | w iten | าร   |     |       |        |  |
|---|------|--------|------|-----|-------|--------|--|
| Α | SHTO | N-TAT  | Е    |     |       |        |  |
| d | BASE | II     | call | for | price | (\$47) |  |

| CP/M®                                                                                                                      |                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| ARTIFICIAL INTELLIGENO<br>Medical(PAS-3)<br>Dental (PAS-3)                                                                 | .\$849<br>.\$849                                                                                         |
| ASYST DESIGN®/FRONTI<br>Prof Time Accounting<br>General Subroutine<br>Application Utilities<br>DIGITAL RESEARCH®           | ER<br>.\$549<br>.\$269<br>.\$439                                                                         |
| NorthStar                                                                                                                  | .\$149                                                                                                   |
| Micropolis. CP/M-Intel MDS PL/1-80 BT-80 MAC RMAC Sid Z-Sid Tex DeSpool CB-80 CBasic-2 Link-80                             | \$175<br>\$135<br>\$449<br>\$179<br>\$ 85<br>\$179<br>\$ 65<br>\$ 90<br>\$ 90<br>\$ 49<br>\$459<br>\$ 98 |
| FOX & GELLER Quickscreen Quickcode dufil MICRO-AP*                                                                         | . \$265                                                                                                  |
| S-Basic<br>Selector IV<br>Selector V                                                                                       | .\$269<br>.\$295<br>.\$495                                                                               |
| HDBS DRS or QRS or RTL MDBS PKG                                                                                            | .\$269<br>.\$795<br>.\$269                                                                               |
| MICROPRO® WordStar. Customization Notes Mail-Merge WordStar/Mail-Merge DataStar WordMaster SuperSort I Spell Star CalcStar | .\$449<br>.\$ 99<br>.\$369<br>.\$249                                                                     |
| MICROSOFT®  Basic-80  Basic Compiler                                                                                       |                                                                                                          |
| Fortran-80<br>Cobol-80<br>M-Sort<br>Macro-80<br>Edit-80<br>MuSimp/MuMath<br>MuLisp-80<br>FPL: Bus. Planner                 | .\$349<br>.\$589<br>.\$175<br>.\$144<br>.\$ 84<br>.\$224<br>.\$174                                       |
| ORGANIC SOFTWARE® TextWriter III DateBook II Milestone OSBORNE® (McGraw/Hill                                               | .\$269<br>.\$269<br>)                                                                                    |
| General Ledger                                                                                                             | \$ 50                                                                                                    |



## **SAVE \$255 ON PRODUCTIVITY PAC #3!**

Everything you need: a wordprocessor, spreadsheet and database. And a phenomenally low, low price!

|             | Retail           | Discount |
|-------------|------------------|----------|
| Final Word  | \$300            | \$270    |
| Plannercalc | \$ 99            | \$ 50    |
| Condor I    | \$295            | \$275    |
|             | <del>\$694</del> | \$595    |

## **SPECIAL COMBINATION PRICE: \$439**

Offer good to the end of the month of publication of this magazine. Call for our other PAC prices.

| Acct Rec/Acct Pay. \$ 59 Payroll w/Cost. \$ 59 All 3 . \$ 129 All 3 + CBASIC-2 \$ 199 Enhanced Osborne (vandatta) (Includes CBasic) \$ 269                                                                                                                                                                                                                                                                                                                                          | 4 Modules . \$1255 All 8. \$4500 UNICORN® Mince . \$149 Scribble . \$149 Both . \$249 The Final Word . \$270                                                                                              | String/80         \$ 8           String/80 (source)         \$27'           ISIS CP/M Utility         \$19           Lynx         \$19           Supervyz         \$ 9           ATI Power         \$ 7'           Mathe Magic         \$ 9           CIS COBOL         \$76                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PEACHTREE*           General Ledger         \$399           Acct Receivable         \$399           Acct Payable         \$399           Payroll         \$399           Inventory         \$399           Inventory         \$399           Surveyor         \$399           Property Mgt         \$799           PR Version         Add \$234           MagiCalc         \$289           Other         less 10%                                                                   | WHITESMITHS* "C" Compiler. \$600 Pascal (incl "C"). \$850 "PASCAL" Pascal/MT + Pkg. \$429 Compiler \$315 S0 Prog. \$175 Pascal/Z \$349 Pascal/UCSD 4-0. \$670 Pascal/M \$355 Tiny Pascal \$76 "DATA BASE" | ZIP MBASIC. CBASIC. \$120 Real Estate Analysis. \$110  APPLE II ®  BRODERBUND  G/L (with A/P). \$440 Payroll. \$350 INFO UNLIMITED® EasyWriter (Prof). \$150 Datadex. \$122 EasyMailer (Prof). \$136                                                                                                                                                                                                                       |
| STAR COMPUTER SYSTEMS           G/L. A/R. A/P. Pay.         \$ 349           All 4         \$1129           Legal Time Billing.         \$ 849           Property Mngmt.         \$ 849           STRUCTURED SYSTEMS*                                                                                                                                                                                                                                                               | FMS-80 \$894<br>dBASE II \$595<br>Condor I \$275<br>Condor II \$535<br>FMS-81 \$445<br>"WORD PROCESSING"                                                                                                  | Other less 159 MICROSOFT*  ✓ Softcard (Z-80 CP/M) \$23: Fortran \$17: Cobol \$49 Tasc \$13                                                                                                                                                                                                                                                                                                                                 |
| Business Packages, Call for Price SORCIM® SuperCalc\$249                                                                                                                                                                                                                                                                                                                                                                                                                            | WordSearch       \$179         ✓ SpellGuard       \$199         Peachtext       \$289         Magic Spell       \$269         Spell Binder       \$349                                                    | <ul> <li>✓ Premium Package. \$549</li> <li>✓ RAM Card. \$129</li> <li>✓ MICROPRO*</li> <li>✓ Wordstar. \$199</li> <li>✓ MailMerge. \$99</li> </ul>                                                                                                                                                                                                                                                                         |
| Trans 86. \$115<br>Act. \$157<br>SUPERSOFT*<br>Ada. \$270<br>Diagnostic! \$49                                                                                                                                                                                                                                                                                                                                                                                                       | Select       \$495         The Word       \$ 65         The Word Plus       \$145         Palantier-I (WP)       \$385         "COMMUNICATIONS"                                                           | Wordstar/MailMerge         \$34           SuperSort I         \$15           Spellstar         \$12           CalcStar         \$17           DataStar         \$26                                                                                                                                                                                                                                                        |
| Diagnostic   3 49     Diagnostic   3 84     Disk Doctor   3 89     Forth (8080 or Z80)   3 149     Fortran   \$219     Fortran w/Ratfor   \$289     C Compiler   \$225     Star Edit   \$189     Scratch Pad   \$266     Stats Graph   \$174     Analiza   \$45     Dataview   \$174     Disk Edit   \$89     Encode/Decode   \$84     Optimizer   \$174     Super M List   68     Erm   \$179     Zap Z-8000   \$450     Utilities   \$54     Utilities   \$54     ACCOUNTING PLUS | Ascom                                                                                                                                                                                                     | VISICORP*  Visicale 3.3 . \$180 Desktop/Plan II . \$210 Visiterm . \$91 Visidex . \$211 Visiterm . \$180 Visidex . \$211 Visiterm . \$180 Visiterm . \$180 Visiterm . \$180 Visiterm . \$210 Visischedule . \$250 PEACHTREE* G/L.A/R.A/P.Pay or Inventory (each) . \$220 Peach Pack P40 . \$790 SOFTWARE DIMENSIONS, INCA Accounting Plus II, G/L.AR, AP, or Inventory (each) . \$380 (Needs G/L to run) **OTHER GOODIES** |
| 1 Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Raid \$224                                                                                                                                                                                                | Super-Text II \$12                                                                                                                                                                                                                                                                                                                                                                                                         |

|          | Versaform VS1VH1                                                                                                                                                                                                                                         | \$350<br>\$445                   |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|          | 16-BIT SOFTWARE                                                                                                                                                                                                                                          |                                  |
|          | WORD PROCESSING<br>IBM PC                                                                                                                                                                                                                                |                                  |
| <u>ر</u> | Wordstar                                                                                                                                                                                                                                                 | \$279<br>\$175<br>\$109<br>\$314 |
|          | IBM PC Wordstar Spellstar. Mailmerge Easywriter Easyspeller Select/Superspell Write On. Spellguard                                                                                                                                                       | \$159<br>\$535<br>\$116          |
|          | 8" 8086 systems)                                                                                                                                                                                                                                         | \$229                            |
|          | (for Spellguard)                                                                                                                                                                                                                                         | \$189                            |
|          | LANGUAGE UTILITIES                                                                                                                                                                                                                                       | Ψ210                             |
|          | IBM PC<br>Crosstalk.<br>BSTAM.<br>BSTMS.                                                                                                                                                                                                                 | \$149                            |
|          | RILAC DIT CYCTEMO                                                                                                                                                                                                                                        |                                  |
| -        | Pascal MT+ /86, SSP. CBasic 86. Pascal M/86. Act 86. Trans 86. XLT 86.                                                                                                                                                                                   | \$679                            |
|          | Pascal M/86                                                                                                                                                                                                                                              | \$445<br>\$157                   |
|          | Trans 86                                                                                                                                                                                                                                                 | \$115                            |
|          | 16-BIT 8" AND DISPLAYWE                                                                                                                                                                                                                                  | \$135                            |
|          | CP/M 86                                                                                                                                                                                                                                                  | \$294                            |
|          | MP/M 86                                                                                                                                                                                                                                                  | \$585                            |
|          | IBM PC                                                                                                                                                                                                                                                   |                                  |
|          | IBM PC SuperCalc VisiCalc Easyfiler. Mathemagic. CP/M Power Condor 21 Condor 22 Condor 23 Condor 20 Condor 20C Condor 20R Statpak Optimizer Desktop Plan III Visidex Visitrend Many others available for unwith the "Baby Blue Board" 8" 16-BIT SOFTWARE | \$269<br>\$219                   |
|          | Easyfiler                                                                                                                                                                                                                                                | \$359                            |
|          | CP/M Power                                                                                                                                                                                                                                               | .\$ 65                           |
|          | Condor 21.                                                                                                                                                                                                                                               | \$265                            |
|          | Condor 23.                                                                                                                                                                                                                                               | . \$895                          |
|          | Condor 20Q                                                                                                                                                                                                                                               | \$175                            |
|          | Statpak                                                                                                                                                                                                                                                  | \$449                            |
|          | Desktop Plan II                                                                                                                                                                                                                                          | \$174<br>\$219                   |
|          | Desktop Plan III                                                                                                                                                                                                                                         | \$259                            |
|          | Visitrend                                                                                                                                                                                                                                                | \$259                            |
|          | Many others available for us                                                                                                                                                                                                                             | se<br>                           |
|          | 8" 16-BIT SOFTWARE                                                                                                                                                                                                                                       |                                  |
|          | SuperCalc<br>CP/M Power                                                                                                                                                                                                                                  | \$269                            |
|          |                                                                                                                                                                                                                                                          |                                  |
|          | FORMATS AVAILABL                                                                                                                                                                                                                                         | +                                |
|          | 8" single density<br>8" OSI                                                                                                                                                                                                                              |                                  |
|          | Superbrain                                                                                                                                                                                                                                               |                                  |
|          | Micropolis/Vector Graphic<br>NorthStar Horizon<br>NorthStar Advantage                                                                                                                                                                                    |                                  |
|          | Osborne                                                                                                                                                                                                                                                  |                                  |
|          | Heath/Zenith<br>Cromemco                                                                                                                                                                                                                                 |                                  |
|          | Televideo                                                                                                                                                                                                                                                |                                  |
|          | Xerox 820<br>Dynabyte                                                                                                                                                                                                                                    |                                  |
|          | Hewlett-Packard 125                                                                                                                                                                                                                                      |                                  |
|          | NEC                                                                                                                                                                                                                                                      |                                  |

Otrona

TRS-80 Model I/II/III DEC VT-180 Altos CP/M-86 IBM PC

Data Factory. . . . . . . . . . . \$134

## LOWER PRICES, COME HELL OR HIGH WATER.

ORDERS ONLY • CALL TOLL FREE • VISA • MASTERCHARGE U.S. 1-800-421-4003 • CALIF. 1-800-252-4092

Outside Continental U.S.—add \$10 plus Air Parcel Post • Add \$3.50 postage and handling per each item • California residents add 6%% sales tax • Allow 2 weeks on checks. C.O.D. \$3.00 extra • Pricessubject to change without notice. All items subject to availability • ®—Mfgs. Trademark. Blue Label \$3.00 additional per item.

CP/M is a registered trademark of DIGITAL RESEARCH, INC.

## THE DISCOUNT SOFTWARE GROUP

6520 Selma Ave. Suite 309 • Los Angeles, Ca. 90028 • (213) 837-5141
IntiTELEX 499-0446 DISCSOFT LSA • USATELEX 194-634 (Attn: 499-0446)
TWX 910-321-3597 (Attn: 499-0446)

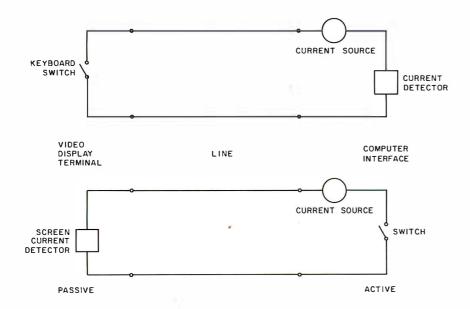
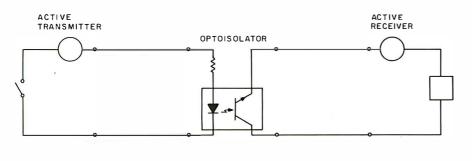


Figure 4: Computer-to-terminal interface using current loops.



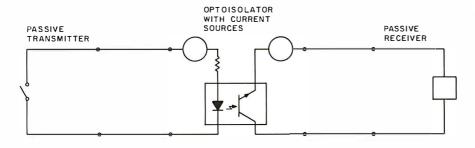


Figure 5: Active-to-active and passive-to-passive converters.

worth looking at the current-loop interface in more detail. Although this interface does not represent a proper standard, many low-cost microcomputer systems are using current loop because it eliminates the need for special power supplies. The current-loop interface is not a modem interface, as RS-232C and RS-449 are. It generally contains just the transmit-and receive-data signals. However, it

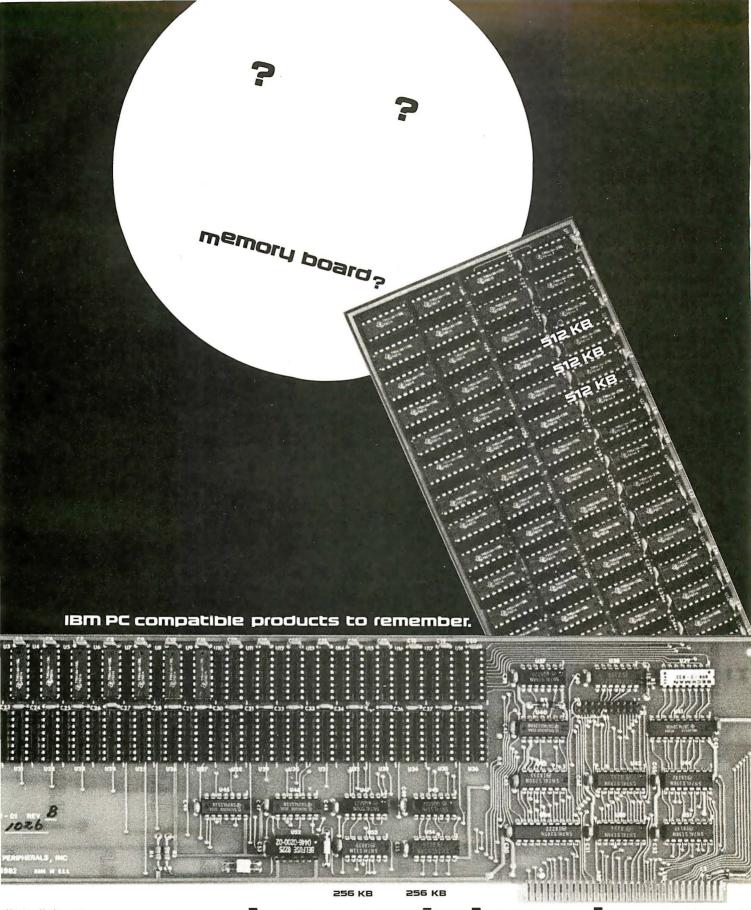
can drive signals at reasonable speeds over respectable distances (9600 bps over 1500 feet), which makes it useful for directly connecting terminals to computers.

The idea of the current loop is to switch a current on and off. The active side of the line generates the current, while the passive side switches or detects it. Either the receiver or transmitter can be active. This gives you four possibilities: Active Receiver, Active Transmitter, Passive Receiver, and Passive Transmitter. Because of the convenience of locating the power supply at just one end of the link (usually the computer), you will find all four of these signals in a single computer-to-terminal connection. You can see this arrangement in figure 4.

Unfortunately, this convention introduces the need for active-to-active and passive-to-passive converters. It is obvious that each link must have one active component (otherwise there is no current to switch), and it is also true that a link may have only one active component, at least in most implementations. Hence, if you want to connect a passive terminal directly to another passive terminal, you must put a passive-to-passive converter in between, Similarly, if you want to connect an active computer to an active computer, you will need an active-to-active converter. These converters are easy to implement and are shown in figure 5. The optoisolator provides complete electric isolation between the two sides, thus eliminating any problems with ground potential differences. The active-to-active converter does not even need a power supply, although the passive-to-passive must have one to generate the current.

## **Automatic Calling Units**

None of the standards examined so far support the automatic placement of calls by a computer. RS-232C and RS-449 provide specifications for answering calls, but not for dialing. For this there is another standard, RS-366 (CCITT V.25) for automatic calling units. Making a telephone call can be quite complicated, although most of us are so used to it that we don't think about the complexity. The computer must be able to determine whether the line is free, figuratively take the phone off the hook, await the dial tone, present the telephone number, and detect and decipher the various audio signals that the telephone network uses to indicate the status of a call (the dial tone, the busy tone, the ringing tone. and the number-unavailable tone).

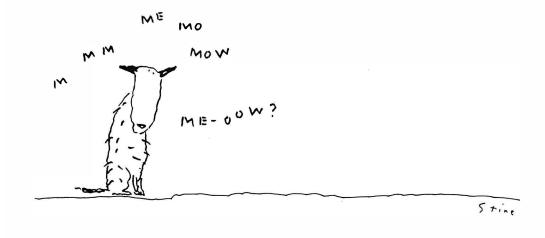


computer peripherals

1117 Venice Boulevard Los Angeles CA 90015 (213) 298-1297 Telex: 194561 LSA

Circle 107 on Inquiry card.

Dogged attempt to learn a second language.



 $\ensuremath{\mathsf{CP/M}}$  is a registered trademark of Digital Research Corp.

## And now, InfoStar.

# The first DBMS you can use without speaking programmerese.

So put away your GO TOs and DO WHILES.

InfoStar is one microcomputer data base system that doesn't ask you to write in code. Or learn a programming language. Instead you make selections from an on-screen menu written in one easy language. English.

Which means you don't have to be a programmer or computer jock to use it. But, in case you are, there's something in it for you, too.

With InfoStar, you can generate a custom application four times faster than with other DBMS software.

Reason being it has a lot of the features that made WordStar\* the standard in the industry. For instance, select-as-you-go menus prompt you through all procedures. And to format a data entry form or report, you simply draw it on the screen. We've said it before: what you see is

than you've come to expect from any microcomputer DBMS. Starting with report writing. A

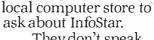
(and self-documenting) capabilities

custom report feature – complete with transactional updating and exception processing abilities - lets you format, manipulate and merge countless different ways. And a quick report feature lets you finish faster than you can count them – usually in 60 seconds or less.

Not that you have to slow down to sort things out either. Because InfoStar can sort five to six times faster than any other DBMS in its class.

And for data entry, there are high-end minicomputer features. Like batch editing. And 200 editing mask combinations, to name a few.

All that's required of you is that you have a CP/M-based computer. And that you take a trip over to your



They don't speak programmerese.

But they're happy to talk business.



\*\*\*\*\*\*\*\*\*\*\*

what you get.

not all you get.

| CCITT | Signal                    | Source                       |
|-------|---------------------------|------------------------------|
| 202   | Call Request              |                              |
| 206   | NB1                       |                              |
| 207   | NB2                       | DTE (computer interface)     |
| 208   | NB4                       |                              |
| 209   | NB8                       |                              |
| 211   | Digit Present             |                              |
| 203   | Data Line Occupied        |                              |
| 204   | Distant Station Connected | DCE (automatic calling unit) |
| 205   | Abandon Call              |                              |
| 210   | Present Next Digit        |                              |
| 213   | Power Indicator           |                              |

| Digit<br>Code | NB8 | NB4 | NB2 | NB1 |
|---------------|-----|-----|-----|-----|
| 1             | 0   | 0   | 0   | 1   |
| 2             | 0   | 0   | 1   | 0   |
| 3             | 0   | 0   | 1   | 1   |
| 4             | 0   | 1   | 0   | 0   |
| 5             | 0   | 1   | 0   | 1   |
| 6             | 0   | 1   | 1   | 0   |
| 7             | 0   | 1   | 1   | 1   |
| 8             | 1   | 0   | 0   | 0   |
| 9             | 1   | 0   | 0   | 1   |
| 0             | 1   | 0   | 1   | 0   |
| EON           | 1   | 1   | 0   | 0   |
| SEP           | 1   | 1   | 0   | 1   |

**Table 6:** Number codes for automatic calling units. In the last four columns a 0 stands for on and a 1 stands for off.

The signals for the automatic-calling-unit standard are listed in table 5. Data Line Occupied tells the computer if someone is already on the line. After checking that the line is free, the computer indicates that it wants to place a call by using Call Request. This effectively takes the phone off the hook. When the automatic calling unit hears the dial tone. it signals with Present Next Digit. Each digit is a binary-coded decimal as shown in table 6. The computer generates the next digit and signals its presence with Digit Present. Shortly afterwards, it again sees Present Next Digit, which indicates that the calling unit is ready for another digit. The sequence continues until the end of the number is reached, which the computer indicates with the EON (end of number) code. The computer can use another code, SEP (separator), in the

case when there might be a second dial tone, as when calling out through a private branch exchange (PBX). Often you have to wait for a dial tone, dial 9, and then wait for a second dial tone from the main exchange. SEP indicates to the calling unit that a second dial tone is expected. The calling unit then waits until that tone is received before asking the computer for another digit.

When the end of the number is reached, the calling unit waits for the called party to answer and then signals Distant Station Connected. Otherwise, if the number is unavailable or busy, it signals Abandon Call.

## Moving into the Digital World

The overwhelming complexity of these standards is symptomatic of the fact that we are asking the analog telephone network to serve a purpose for which it was never designed. No one foresaw automatic placement and answering of calls by computers when the first phone was installed.

Today, the telephone network is slowly moving into the digital era, an advancement complicated by the staggering investment that the telephone companies have in existing equipment. In anticipation of widespread direct digital connection to the telephone network, CCITT is offering a new, cleaned-up recommendation specifically designed for the digital telephone exchange. It is X.21, and the minimum line speed is likely to be 56,000 bps, the data rate needed to encode voice to telephone quality. Just imagine the impact this will have on your home use of remote computers or information networks like the Source.

The X.21 standard uses only eight lines (see table 7). The computer sends data to the modem on the Transport line and data moves in the reverse direction on the Receive line. Control and Indication provide control channels in the two directions. The X.21 modem generates a bit-rate clock and possibly a byte-synchronization signal. The last two wires give a voltage reference and ground connection.

Although Control and Indication are control wires, most of the controlling information actually uses the Transport and Receive lines. The computer changes the state of Control when it wants to place a call, just as you lift the handset off the telephone when you want to dial. To terminate the call, the computer changes Control back to the idle state. Similarly, the modem changes the state of Indication when the remote telephone is answered and changes it back if it shuts down. All the dialing information travels on the Transport line and all the information about tones comes back on the Receive wire.

The major advantage of X.21 over RS-232C and RS-449 is that the X.21 signals are encoded in serial digital form. For example, when a dial tone is received, a continuous sequence of ASCII "+" characters is sent to the computer on the Receive wire. In

# Mr. Dow and Mr. Jones introduce Dow Jones Software Mr. Jones



Jones: "Mr. Dow, look what they're selling in that new store down the street: Dow Jones Software. You haven't gotten us into ladies' fashions, have you?"

**Dow:** "No, Mr. Jones. That's a computer store, and our software products allow investors and business professionals to use a personal computer like this one here to easily manage financial information."

Jones: "But what about our reputation? We've been leaders in serving the business and financial community for over 100 years. Are you sure this new software will be as reliable as The Wall Street Journal and Barron's?"

Dow: "Of course, Jones. Our software is so reliable we back it up with a full-year warranty. People trust Dow Jones Software the same way they trust the Journal. And we have a toll-free Hotline number in case they want expert help."

Jones: "Couldn't that be a lot of phone calls? After all, we've got the Dow Jones Averages to get out every day."

**Dow:** "Don't worry, Jones. Our software is very easy to use, and we have a fully staffed Customer Service Department to

respond to our dealers and customers."

Jones: "Just what can our software do?"

Dow: "In a nutshell, Jones, with a personal computer, a telephone, a modem and Dow Jones Software, you can easily perform complex analyses on the information available from our information service, Dow Jones News/Retrieval®."

Jones: "People really use our software to make decisions?"

Dow: "Absolutely. Once you've stored the information you want, our software does the rest. For instance, with one Dow Jones Software product you can follow indicators for stocks, sort, rank, screen and set critical points for buying and selling. With another, you can easily construct technical charts. Look at this beautiful graph."

Jones: "You mean all those calculations I've been doing by hand I could do in a fraction of the time with this software? That's great!"

**Dow:** "It is, Mr. Jones. Just like the Journal, Dow Jones Software is a resource you can bank on!"



Dow Jones Market Analyzer'

A technical analysis product that allows private and professional investors to automatically collect, store and update historical and daily market quotes, and to construct technical analysis charts at the touch of a key. Dow Jones Market Microscope'

A fundamental analysis product that allows professional money managers to choose and follow indicators for extensive lists of stocks and industry groups, and to sort, rank, screen and set critical points for buying and selling.

Dow Jones Market Manager™

A portfolio management product for private or professional investors who desire immediate access to pricing and financial information, and who need an accounting and control system for their portfolios of securities.

Dow Jones Connector™

A communications product for the business or professional person who wants instant electronic access to news, facts and vital data at the home or office, via personal computer, simple terminal, communicating word processor or teletypewiter.

See your computer dealer

1-800-345-8500 Ext. 48

for a free brochure (Alaska, Hawaii and foreign, call 1-215-789-7008 Ext. 48) DOW JONES SOFTWARE<sup>TM</sup>

...Bank on it.

| CCITT | Signal                 | Source                   |
|-------|------------------------|--------------------------|
| Т     | Transport              |                          |
| С     | Control                | DTE (computer interface) |
| Ga    | DTE Common Return      | , , ,                    |
| R     | Receive                |                          |
| 1     | Indication             | DCE (X.21 modem)         |
| S     | Signal (bit timing)    |                          |
| В     | Byte Timing (optional) |                          |
| G     | Ground                 |                          |

| Calling Computer                         | X.21 Modem                                        | Telephone Network         |  |  |  |
|------------------------------------------|---------------------------------------------------|---------------------------|--|--|--|
| turn Control on (pick up<br>handset)     |                                                   |                           |  |  |  |
|                                          | wait for dial tone                                |                           |  |  |  |
|                                          |                                                   | dial tone comes           |  |  |  |
|                                          | signal dial tone with ASCII "+++" on Receive line |                           |  |  |  |
| send phone number on<br>Transport line   |                                                   |                           |  |  |  |
|                                          | dial the call                                     |                           |  |  |  |
| ,                                        |                                                   | remote phone rings        |  |  |  |
|                                          | send call progress signal on Receive line         |                           |  |  |  |
|                                          |                                                   | remote phone is picked up |  |  |  |
|                                          | turn Indication on                                |                           |  |  |  |
| —communication on Transport and Receive— |                                                   |                           |  |  |  |
| turn Control off (put down handset)      |                                                   |                           |  |  |  |
|                                          | turn Indication off to acknowledge                |                           |  |  |  |
|                                          |                                                   | line becomes disconnected |  |  |  |

**Table 8:** The sequence of events in an X.21 call, with time running from top to

effect, this is a digital dial tone. The computer dials the number by transmitting it as a series of ASCII characters on the Transport line, a bit at a time. This method is much more convenient for the computer than having a parallel connection for the digits because today software is much cheaper than parallel output ports.

After dialing the call, the computer receives call-progress signals from the modem on the Receive wire. These signals indicate such call states as number busy, access barred, and network congestion. Table 8 shows an example of the X.21 standard in operation. Notice that the Control and Indication lines change state only once

per call; the main control information is sent on Transport and Receive.

### The Future

The telephone network is rapidly becoming more complicated. The computer technology in the telephone exchange increases your options for interaction with the telephone system. For example, on an advanced exchange, if you get a busy signal, you can place the call again by issuing a repeat-last-call command. Alternatively, you can store that last number you called for future reference and free the phone for other calls. Another option, short-code dialing, allows you to associate short codes with commonly dialed numbers. You can also bar both incoming and outgoing calls. A diversion service allows you to direct all incoming calls to another telephone either immediately or if the number is busy.

By using serial digital coding instead of dedicated wires for special functions, X.21 provides a sound basis for building such services into computer communication. A shortcode-dialing or repeat-last-call facility would be extremely useful, for example, to reconnect a call every time you complete a line of typing at the terminal. If the line could be disconnected while you are typing, long distance calls would be much cheaper. Of course, this would also depend on the tariff policies of the telecommunication carriers. Using X.21 could allow many of the advantages of packet-switching without the associated complexity. Imagine the possibilities of setting up a threeparty call between computers! You can't do this now because you still need operator intervention, but the new exchanges will allow you to do it yourself. Possibilities like these show us where the future is, and with the X.21 data-communication standard. we may have found the path out of the standards jungle.  $\blacksquare$ 

### References

- McNamara, J. E. Technical Aspects of Data Communication. Bedford: MA: Digital Press/Digital Equipment Corporation, 1978.
- 2. Tanenbaum, A. S. Computer Networks. Englewood Cliffs. NJ: Prentice Hall. 1981.

bottom.

# owerful CP/M Software.

For Apple, Osborne, TRS-80, North Star, SuperBrain, Micropolis, Altos and others.

Now only \$29.95 each!

# **NEVADA**

was \$199.95 now only **\$29.95.** 

When we introduced Nevada COBOL three years ago, it was loaded with innovations. Today's Edition 2 is even better! For

- ☐ It's 4 to 20 times faster than any other micro COBOL according to an independent study\*. What's more, it's easier
- ☐ Extremely Compact. You can compile and execute up to 2500 statements in 32K RAM, 4000 statements in 48K, etc.
- ☐ It's based upon the ANSI-74 standards with level 2 features such as compound conditionals and full CALL CANCEL.
- ☐ You get a diskette, 153-page manual with lots of examples and 16 complete COBOL source code programs.

#### NEVADA

was \$199.95 now only **\$29.95.** 

- ☐ IF . . THEN . . ELSE constructs.
- □ COPY statement.
- ☐ A very nice TRACE style debugging.
- ☐ 150 English language error messages.
- ☐ You get a diskette, 174 pages of Documentation and five sample programs.

# **NEVADA**

was \$149.95 now only **\$29.95.** 

- ☐ Perfect for industrial training, office training, drill and testing, virtually all programmed instruction, word puzzle games, and data entry facilitated by prompts.
- □ What's more, John Starkweather, Ph.D., the inventor of the PILOT language, has added many new features to Nevada PILOT. There are commands to drive optional equipment such as Video Tape Recorders and Voice Response Units. There's a built-in full-screen text editor and much more.
- ☐ Meets all PILOT-73 standards for full compatibility with older
- ☐ You get a diskette, 114-page manual and ten useful sample programs.

# NEVADA

was \$119.95 now only **\$29.95.** 

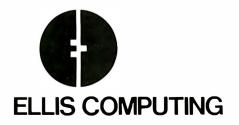
- ☐ A character-oriented full-screen video display text editor designed specifically to create COBOL, BASIC and FORTRAN programs.
- ☐ Completely customizable tab stops, default file type, keyboard layout and CRT by menu selection.
- ☐ The diskette comes with an easy to read manual.

To make our software available to even more micro users, we've slashed our prices. MAIL TODAY! What's more, we're offering a money back guarantee. If for any reason you're not completely satisfied, just return the package—in good condition with the sealed diskette unopened-within 30 days and we'll refund your money completely. This is a limited time offer, so order yours today! Shipping/handling fees. Add \$4.00 for first package and \$2.00 each additional

'A Compiler Benchmark: A Comparative Analysis of Four COBOL Compilers" by Stephen F. Wheeler. Trademarks: CP/M, Digital Research; TRS-80, Tandy Corp. Apple II, Apple Computer Inc.; Osborne 1, Osborne Computer Corp. @ 1982 Ellis

package. OVERSEAS Add \$15.00 for first package and \$5.00 each additional package. Checks must be in U.S. funds and drawn on a U.S. bank! Computing.

To: Ellis Computing (415) 753-0186 3917 Noriega St San Francisco, CA 94122 The CP/M operating system and 32K RAM are required. Indicate diskette format: □ 8" SSSD □ Apple CP/M □ Osborne □ N\*SD □ N\*DD ☐ TRS-80 Mod I ☐ Micropolis Mod II ☐ TRS-80/mapper ☐ Superbrain DD DOS 3.X □ COBOL □ PILOT Indicate software packages: ☐ FORTRAN □ EDIT Send my order for \_\_\_\_ packages @ \$29.95 each Total \_ In CA add sales tax \_ ☐ Check enclosed ☐ COD Shipping/handling \_ If COD add \$4.00 \_ ☐ MasterCard TOTAL \_ \_\_\_\_ Exp. Date \_\_\_ \_\_\_\_\_\_Phone # \_\_\_\_\_ Signature \_\_\_ Ship to: Name\_ Company\_\_\_ City/St/Zip \_\_\_\_\_ Country \_\_\_ Offer expires 2/28/83



Circle 165 on inquiry card. 179 BYTE February 1983

# Introducing the portable computer for professionals on the move. Hewlett-Packard's new HP-75.

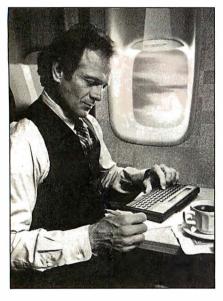
A decade ago, we introduced the world's first scientific pocket calculator and rendered the time-honored slide rule obsolete.

Now we're introducing the HP-75 portable computer. And if press reaction is any indication, history is about to repeat itself.

### As small as a book. As powerful as a personal.

Desktop-computer power in a handsome 26-ounce package. That's the HP-75. It's just 10 inches by 5 inches by 1¼ inches.

But don't let the compactness fool you. Inside its rugged case lies a 48K-byte, ROM-based operating system. With a comprehensive, 147-command instruction set that helps you write hard-working, memory-efficient BASIC programs.



Plug-in ROM ports let you add up to three 32K-byte software modules—modules that solve tough problems without sacrificing user memory.

And that user memory gives you up to 24K bytes of program and data storage.

It all adds up. A fully loaded HP-75 is a 168K-byte computing powerhouse in calculator clothing.

Want more? A built-in magnetic card reader provides a convenient, inexpensive way to store and retrieve programs or data.

The HP-75's typewriter-like keyboard means rapid, accurate entry of text or data. And when we say you can touch type on it, we mean you can touch type on it.

Those keys, by the way, can be redefined with your favorite commands or programs. Up to 196 unique key combinations in all.

#### Immediate, convenient access to your most frequently used programs.

Thanks to the HP-75's multiple-file

structure, programs, data and text can be named, simultaneously stored in memory, and programmed to interact with each other.

Add continuous memory, and you've got a computer that's designed to solve problems on the go. Simply load your favorite files and enjoy immediate access to any or all of them. The files are retained in memory until you decide to delete them—even when the machine is turned off.

### Time and appointments to keep you on schedule.

The TIME key brings to display the day of the week, date and time to the nearest second.

The APPOINTMENT feature reminds you—an hour from now or a year from now—of things you have to do. You can have a silent message on the display, any one of six alarms, or a combination of both.

Even if the machine is turned off, it will "wake up" and alert you of an appointment. Or it will execute programs or control peripherals according to predetermined schedules.

In an environmental test, for instance, where readings are taken every half hour, the HP-75 can make sure its owner gets the weekend off.

### Software tailored to solve your specific problems.

HP-75 software is now available in areas such as math, engineering, finance, and statistics. With spreadsheet analysis\*\*\* on the way.

tics. With spreadsheet analysis\*\*\* on the way.
Our plug-in math module,\*\*\* for instance, solves polynomial roots, evaluates integrals, and performs finite Fourier transforms.

With our text-formatter module,\*\* you'll compose memos, letters, and short documents virtually anywhere; then print them out when you return to your home or office.

In addition, our third-party software program assures you of ever-expanding software variety.

If you're a volume purchaser or OEM, give us a call. We can help you create custom HP-75 systems with special plug-in modules, magnetic cards, digital cassettes, and keyboard overlays.

### Peripherals for a total computing package.

The HP-75 is equipped with the Hewlett-Packard Interface Loop, giving you a choice of 15 peripherals. (And that choice is expanding. The HP-75 can work simultaneously with up to 30.)

In a battery-powered briefcase system weighing about seven pounds, you might have the 24-character printer, digital cassette drive and acoustic modem.\*

A desktop system might include the 80column impact printer, full-color graphics plotter, and 12-inch video monitor.

And the HP-75 can "talk to" other computers, peripherals, and instruments with our HP-IB (IEEE-488),\*\* RS-232,\*\*\* and

GPIO interfaces.

In summary, the HP-75 is the heart of an extremely versatile system, in addition to its stand-alone capabilities.



#### Manuals to make sure you get the most from your machine.

Chock-full of examples and helpful hints, our owner's manual will get you up and running in short order. And it's organized to help you access the information you need to get on with the job at hand.

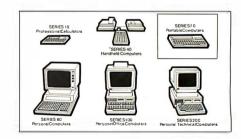
A supplementary reference guide provides a concise summary of the computer's operating protocol and instruction set.

#### The value you're looking for.

What is the price of all this power in this compact package? \$995\*\*\*\* A lot less than you might pay for a personal computer you can't take with you.

See the HP-75 today. It's the smart choice for professionals on the move.

For the authorized HP dealer or HP sales office nearest you, call TOLL-FREE 800-547-3400 (Oregon, Alaska, Hawaii: 503-758-1010). TTY users with hearing or speech impairments, dial 503-758-5566.



- \*Call our toll-free number for availability.
- \*\*Available March, 1983.
- \*\*\*Available May 1, 1983.
- \*\*\*\*Suggested retail price. May vary outside U.S. Peripherals and software not included.





program execution Memory:

User (RAM)—16K bytes, expandable to 24K bytes • Operating system (ROM)—48K bytes
 Plug-in software (ROM)—up to 96K bytes

Size and weight: 10" X5" X1¼" 26 oz. 48K-byte, ROM-based operating system:
• 8-bit CMO S CPU • Multiple file structure in continuous memory • Instruction set: 52

system commands, 43 BASIC commands, 41 numeric functions, 7 string functions, 6 timemode commands, 16 arithmetic/logical/

Time/appointments:
• Perpetual clock/calendar • 12- or 24-hour format • Appointment control of command/

Typewriter-like QWERTY keyboard:

• 65 keys • 194 redefinable key combinations (3 32K-byte modules)

Integral mass storage: hand-pulled card reader (1.3K bytes per card)
Built-in interface: HP-IL; choice of 15 peripherals
Power supply: 3 AA NiCad batteries (AC adapter/charger included)

0 **Liquid-crystal display:** 32-character window on 96-character line

# A Proposed Floppy-Disk Format Standard

ANSI considers a format that would make floppy disks interchangeable.

Chuck Card 2192 Buckboard Circle Warrington, PA 18976

A few things in the microcomputer world are interchangeable. For example, certain printers, modems, and BASIC programs can be used on a fairly large number of systems. Floppy disks, unfortunately, are not in this group. (And if for some reason you find that hard to believe, look for any evidence of interchangeable disks in the ads of this issue of BYTE. But please don't do it now; just take my word for it.) When you choose a particular microcomputer, you also choose the disk format you'll have to live with for as long as you own the computer. Fortunately, most major software is available in several formats. But, when you want to send something on a disk to friends, will they be able to read it?

Think of all the software you've wanted but couldn't get in the format you needed for your computer. No, I

#### About the Author

Chuck Card is a member of the Standards Planning and Requirements Committee of the American National Standards Institute Committee X3 (Information Processing Systems). am not talking about the 6502 code you can't execute on your Z80 (or the other way around). I'm talking about those things that your processor may be able to handle, but your disk-drive controller cannot.

And if you think this disk incompatibility is a problem for users, think about what this means for independent software vendors. If you take a look at an old issue of BYTE, you will find, in double-page ads, a list of the disk formats one software distributor has been willing to generate for its customers. That distributor doesn't advertise like that anymore, but things have not improved.

Obviously, a standard disk format is needed. But, unfortunately, none was being offered. Thus, in an effort to at least get the ball rolling, I submitted a standard-disk-format proposal of my own to the American National Standards Committee for Information Processing Systems (Committee X3; part of the American National Standards Institute, or ANSI). In this article, I will give a brief description of that proposed format

and will suggest how you as a computer user can help determine what the final adopted standard will be.

First, let's establish what we mean by disk formats. Are we talking about text or command files? The answer is either. We are interested in the fact that the files in the various systems are not compatible. Or worse, the files themselves are quite compatible but the disks are not.

But how can that be? Aren't most disks recorded according to the same standards? Indeed, they are. The problem is that the recording standards deal only with such topics as tracks and the way bits are defined on the storage medium, plus the physical characteristics of the medium itself.

What has been proposed is a disk format standard for disk directories and general file organization flexible enough to accommodate further development and evolution. After lots of study of the various disk formats currently available, I found that there is a common feature to some of these formats, a pattern that many of you have undoubtedly noticed.

# Squeeze µP development support out of your CP/M-80 system.

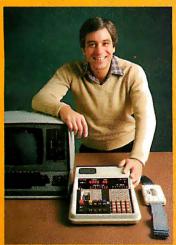


## Get more performance from your personal microcomputer system.

Next time you plug in your CP/M-80 based computer, plug in Applied Microsystems' powerful microprocessor development support. Adding our new Em-Pac'software to one of our EM-Series Diagnostic Emulators will turn your personal computer into a powerful microprocessor development system. With many of the features you'd expect from a system costing three times as much.

#### Symbolic debugging saves time.

Em-Pac software lets you download and debug software using the same labels and symbols used in the program. Any values, like



# Microprocessors Supported:

the one defining breakpoints or memory addresses, can be referenced against the symbol names. This speeds up debugging and reduces the time you spend integrating hardware and software

## Greater flexibility shortens the engineering schedule.

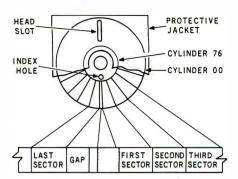
English language commands simplify the programming process. You can also define a long string of commands for the emulator to execute with only one command. And Applied Microsystems can provide support for the 8048, Z80, 8080 and 8085 familes of microprocessors. So you don't have to learn a completely new system next time you want to change microprocessors.

#### Find out more ...

Contact Applied Microsystems for more information on our new CP/M-80 or ISIS-II compatible software. Call us **TOLL FREE** at **800-426-3925**, or write Applied Microsystems, 5020 148th Ave. N.E., P.O. Box 568, Redmond, WA 98052.

# Applied Microsystems

\*Em-Pac is a registered trademark of Applied Microsystems Corporation.



**Figure 1:** A diagram of a typical formatted 8-inch floppy disk.

#### The Media-Parameter Block

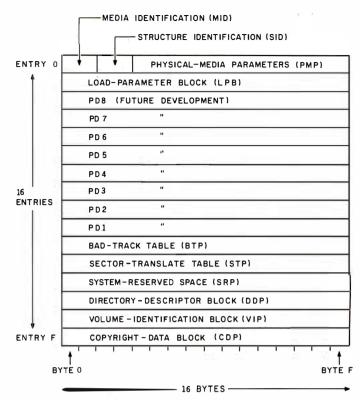
Although notable exceptions exist, most disks seem to have a mystical sector on cylinder 0 (or track 0). It falls under the first read/write head and is the first data recorded on the track (sector 1). If the terms cylinder, head, and sector are confusing, look at figure 1.

Almost all disk drives read this home sector the same way. My proposal is to place certain standard information in this sector, information that will explain how the rest of the disk is formatted. Fortunately, most disk controllers can be programmed to read and write disks in more than one way. Thus it would be possible for one of these disk controllers to read the home sector and then be programmed to read the rest of the disk. In the home sector will be information on such things as the recording technique, the number of bytes in each sector, how many cylinders, heads, sectors per track, and so on. This information would in effect tell the disk drive how to read the rest of the disk.

That covers the physical issues. What about considerations such as the load block, which some systems use? The proposal deals with that as well as the interlace formula, copyright notices, bad-track tables, system-reserved space, volume identifiers, and the directory description. While these are not all required, the place to find them can be identified without wasting storage space if they are not present.

If you refer to figure 2 you will see a proposed layout for the 256





**Figure 2:** A diagram of the media-parameter block (MPB), the 256 bytes of the first sector of the proposed standard disk format. The information in this sector describes how the rest of the disk is formatted. Each block contains specific information or points to the area of the disk that has that information.

| Bit | Field                                                         | Mnemonic                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                            |
|-----|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0   | Physical-media-parameter table                                | PMP                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                            |
| 1   |                                                               | I PB                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                            |
| 2   | •                                                             |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
|     |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| -   |                                                               | * * * * * * * * * * * * * * * * * * * *                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                            |
|     |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
|     |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
|     |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 1   | Bad-track table                                               | BIP                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                            |
| _   |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| Ü   |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 1   |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 2   |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 3   | 11                                                            |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 4   | 111                                                           |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 5   | 11                                                            |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 6   | 11                                                            |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| 7   | "                                                             |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
| •   |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
|     |                                                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                            |
|     | 0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>0<br>1<br>2<br>3<br>4 | O Physical-media-parameter table Load-parameter block Copyright-data block Volume-identification block Directory-descriptor block System-reserved space Sector-translate table Bad-track table  Reserved for future standardization  "" "" "" "" "" "" "" "" "" "" "" "" " | O Physical-media-parameter table PMP Load-parameter block LPB Copyright-data block CDP Volume-identification block VIP Directory-descriptor block DDP System-reserved space SRP Sector-translate table STP Bad-track table BTP  Reserved for future standardization  "" "" "" "" "" "" "" "" "" "" "" "" " |

**Table 1:** Bytes 2 and 3 of the media-parameter block form the structure identification (SID). These bits signify which of the pointer fields in the MPB are active.

characters of the home sector, or as we call it, the media-parameter block (MPB). The first two bytes (bytes 0 and 1) are for identifying the media from a software-supplier point of

view. This is jargon for saying that these bytes are arbitrary but important.

The next two bytes (bytes 2 and 3) make up the structure identification

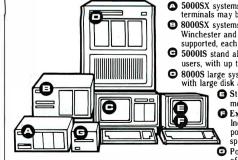
# The IMS Family

IMS Computer products not only fulfill the requirements of stand alone applications, they are designed to be cost effective, intelligent nodes in a total network environment! Each product fulfills a particular requirement of the

network with a conservative functional overlap of the system above and below in the Family Tree.

The IMS family is growing rapidly—keeping pace with technology and the ever increasing needs of industry.





5000SX systems computer; S100 based archival node to which six user terminals may be connected, each with its own processor and memory.

The Ever Expanding IMS Product Line

8000SX systems computer; S100 based archival node with dual floppy, Winchester and tape back up capability. Six user terminals may be supported, each with its own processor and memory.

© 5000IS stand alone intelligent node, S100 based. May support up to four users, with up to 25 MByte Winchester with dual floppies.

8000S large system computer. S100 based. Can support up to 16 users with large disk and tape back up capability.

 Stand alone intelligent CPT with high recognition.

Stand-alone intelligent CRT with high resolution monitor and removable typist keyboard.

Expanded CRT to be used as Intelligent Note Processor. Includes Micro Processor, 64K of memory and four serial ports—two of which are to be used to connect into high speed network communication.

Portable cartridge tape back up. Stores 17.5 MBytes of data. Operates in start/stop or streamer modes.

For complete information and specifications plus the location of your nearby IMS International dealer, call or write today! (714) 978-6966 or (702) 883-7611



2800 Lockheed Way Carson City, NV 89701

Telex: 910-395-6051

We Build Computers As If Your Business Depended On Them.

| Mnemonic<br>PSS<br>PCC<br>HCT<br>PST<br>RFT | Description Physical sector size in bytes (16-bit value) Physical cylinder count (16-bit value) Number of heads per cylinder Number of sectors per track Recording-format table 01 = FM 02 = MFM 03 = MMFM                                                                                             | Byte(s)<br>Location<br>04, 05<br>06, 07<br>08<br>09<br>0A |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| TAS                                         | Track-access sequence  00 = Cylinder (Increment head count before advancing cylinder count.)  01 = Side A (Increment cylinder count before advancing head count to highest cylinder, then decrement cylinder count after incrementing head count; CP/M format.)  02 = Side B (Increment cylinder count | 0B                                                        |
| RES                                         | before advancing head count to<br>highest cylinder, then return to<br>cylinder 0 and advance cylinder<br>count after incrementing to new<br>head.)<br>Reserved for future standardization                                                                                                              | 0C<br>through<br>0F                                       |

**Table 2:** A description of the bytes in the physical-media-parameter table (PMP) in figure 2.

| Mnemonic<br>CST<br>HST<br>SST<br>CEN<br>HEN<br>SEN<br>SID | Description Starting cylinder for load area Starting head for load area Starting sector for load area Ending cylinder of load area Ending head of load area Ending sector of load area System identification (two bytes requiring registration) | Byte(s)<br>Location<br>10, 11<br>12<br>13<br>14, 15<br>16<br>17<br>18, 19 |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|                                                           | Byte 18 Byte 19  00 00 = 8080  01 00 = Z80  02 00 = 6800  03 00 = 68000  04 00 = 8086  05 00 = Z8000                                                                                                                                            |                                                                           |
| SIC                                                       | System configuration (two bytes requiring registration for variables on SID)                                                                                                                                                                    | 1A, 1B                                                                    |
| LFI                                                       | Load-format indicator (one byte for indication of load format)                                                                                                                                                                                  | 1C                                                                        |
| ,                                                         | 00 = Sequential: begin at start cylinder, head, and sector; load at start of system memory 01 = Sequential with load address- ing at first locations of start cylinder, head, and sector (see load-element                                      |                                                                           |
| LFQ                                                       | descriptor) Load-format qualifier (one byte of system-dependent load qualifier                                                                                                                                                                  | 1D                                                                        |
| LFR                                                       | used as a check for load condition) Load-format reserve (reserved for future standardization)                                                                                                                                                   | 1E, 1F                                                                    |

**Table 3:** A description of the bytes that make up the load-parameter block (LPB) in figure 2.

(SID). Each bit indicates whether one of several blocks or tables are active. Each "1" bit means that the corresponding pointer field for that block is in use for its appointed purpose. The layouts of bytes 2 and 3 are given in table 1. The exact purpose of the bits in byte 3 has not yet been determined, but they are reserved in case the media-parameter block should ever grow to 512 bytes.

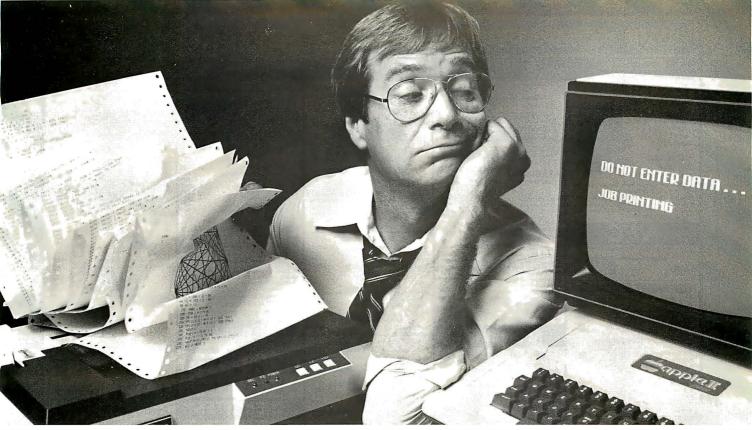
Table 2 describes the bytes in the physical-media-parameter table (PMP) in figure 2. If you examine these bytes closely, you can see that a huge disk can be accommodated. No, I haven't seen any new product announcements; this is just a little groundwork to handle all those rumors coming out of Silicon Valley.

The load-parameter block, while not always needed, has some features we haven't seen on disks previously (see table 3). These are typical of the new features that seem to come out of the woodwork when a new standard is designed. In particular, your attention is called to the SID byte in table 3. That byte contains information on the type of microprocessor that is expected to execute the code in the load block. This information will help prevent you from trying to execute 6502 code on your 8088.

Also noteworthy is an accommodation for new formats (that is, new for microcomputers) such as relocatable object code. Yes indeed, the proposed standard is trying to look as far ahead as is practical.

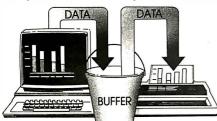
Those among you who have used Unix may be wondering about the chained directories of that system. They would be easy to add. The directory in this new proposal could serve as the root directory for a series of subdirectories. From then on, it is just a matter of designating a file for each subdirectory. The directory-descriptor block in figure 2 would describe the root directory and the individual fields in it.

I am purposely avoiding giving more details here. This format is just a proposal, and other people have written papers about features that have not yet been adequately discussed. I would hate to see any of you go write code and then find that there



# If your printer uses your Apple more than you do, you need The Bufferboard.

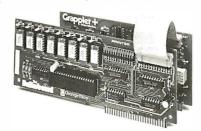
If your Apple is locked into the "PRINT" mode so much that you've taken up solitaire to kill the boredom, you need a buffer. And if your computer is the Apple II or III, the only buffer for you is The Bufferboard. Expandable to 64K of storage, The Bufferboard stores an instantaneous **bucketful** of print data from your computer. Then it feeds the data to your printer at its own printing rate. Your Apple is set free from driving your printer and is ready for more data from you.



#### Take your existing interface and buffer it!

Only The Bufferboard has a simple Interface-Docking System. No bulky boxes

or expensive power supplies are needed because The Bufferboard fits right into your Apple—and docks onto your existing printer interface. The result is convenient



and economical buffering of most popular printer interfaces, including the Grappler +  $^{\text{TM}}$  interface, Epson interface, and Apple printer interface. Thirty seconds and a single hook-up are all you need to end the printer waiting game forever.

### Up to 20 letter-size pages stored at a time.

The Bufferboard comes standard with 16K, and is expandable to 32K or 64K of buffering capacity with the addition of

memory chips. This "bucket" will hold up to 20 pages of a print job, allowing you freedom to use your Apple.

## The Bufferboard—designed exclusively for the Apple Computer.

Specifications:

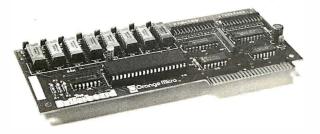
Versions for Grappler + interface, Epson interface, Apple interface, and other popular printer interfaces • 16K buffer standard
 Upgradeable to 32K or 64K • Automatic memory configuration • Automatic self test • Includes interface docking cable.

The Bufferboard is made by Örange Micro, Inc.; the same people who brought you the popular Grappler + printer interface. Both the Grappler + and The Bufferboard are now available at your local Apple dealer.

Apple is a registered trademark of Apple, Inc. Epson is a registered trademark of Epson America, Inc.



1400 N. Lakeview, Anaheim, CA 92807 U.S.A. (714) 779-2772 TELEX: TX 183511 CSMA





Circle 310 on Inquiry card.



had been changes. In this article, I am just nailing down the concepts; the actual bit-fiddling is yet to come.

#### Other Proposals

Other disk-format proposals have been suggested, but these proposals always seemed to be lurking off in the distance. After a long wait (some may say too long), I was asked to take the issue in hand and write my own proposal. Certain things undoubtedly were left out. Things like "my secret sauce key" that some suppliers use to copy-protect their disks are not directly referenced, but that does not preclude them. Standardizing them, however, might make the software pirate's job a little bit too easy.

One proposal that surfaced as this article was written comes from the National Bureau of Standards and has its origin in Europe in the International Organization for Standardization (ISO, Committee TC97/SC15). From what I have seen, that proposal is not completely incompatible with what has been described here. If the ISO proposal were slightly modified, it could be added to my proposal,

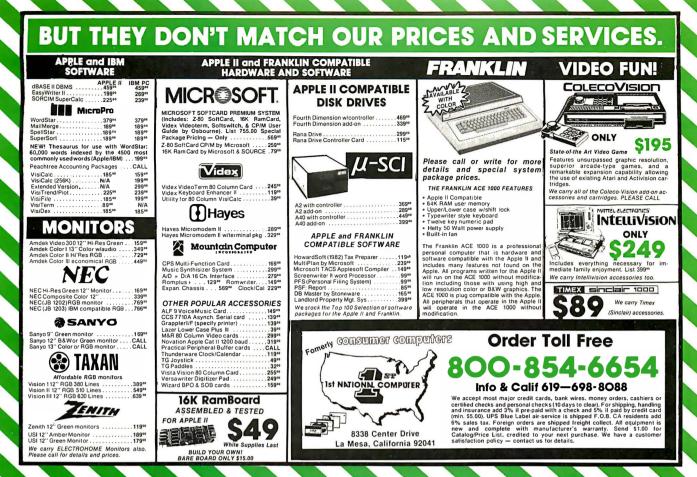
thus supplying my proposal with even more optional formats. I hope the two efforts can be merged into a single cohesive standard.

You might think this whole thing is a bit fantastic. For such a standard to be developed, all of the major software developers would have to agree on it. And why would the big suppliers all of a sudden get involved in working together on a standard? My guess is that some of the older established companies are more standards-oriented than some of the start-up ventures that have formed the foundation of the microcomputer field. These older companies, such as IBM, Sperry Univac, Xerox, and Digital Equipment Corporation, see that they have a need to interchange disks just as you and I do. Moreover, they have huge investments in systems that use structures rather different from those used on personal computers. With this new standard, it would be possible to link these different structures with each other and with microcomputers.

Also, some microcomputer companies, such as Digital Research,

Morrow, and Osborne, have shown interest in a standard disk format. My proposed format is not the same as the CP/M operating system or its cousins, but it is similar. And I can foresee products that will bridge the gap between these formats.

I hear that Version 3.0 of CP/M will be upon us by the time this appears in print, and it will take into account things that have been available to those who use other operating systems (for example, the Flex system on the 6800 and 6809 systems). What features might Version 3.0 include? How about date stamps to indicate when a directory entry was created? What about permission codes for shared access? This latter feature may not be very exciting for anybody not in a multiuser situation. But a lot of us have often dealt with that situation and see the shared-access problem. The supplier of CP/M, Digital Research, feels the need for multiuser and networking versions of its systems. Strangely, however, these issues did not seem to come up earlier when people had to share one disk on the single-user systems.



Circle 119 on inquiry card.

#### Other Disks

You may have noticed that I have been talking about disks in general rather than just the flexible disk cartridges we know as floppies. Why? Software suppliers and users have been pushing hard for compatibility between all types of storage media. Many people want the new hard-disk cartridges to work with software as if they were just large versions of their black-enveloped cousins. It would be rather foolish to invent new structures for no compelling reason.

Similarly, many suppliers and users want to get the less-than-51/4inch disks under control before we see them explode all over us. We should be able to use the format proposed here on these new 3- to 3½-inch disks. So far, the technologies that have been proposed for these disks have been compatible with our proposal.

By adding extensions in the future, we should be able to use this format for a long time. I intended that the format serve as a guide for all of the newly emerging exotic disks we are reading about. This would be similar

to the way the Shugart media interface has been adopted as a guide for all floppy-disk-drive manufacturers. Otherwise, more chaos will follow. We hope that the suppliers and developers of these new devices will let us know about any special needs they may have.

But what about the piracy problem? Wouldn't such a standard make it worse? Ours is an interesting industry. If you make things challenging, the software pirate will take the challenge. A former boss often reminded me that "you can't make a good contract with a crook." I have always taken that to mean that goodwill is as important as good locks. We can offset the piracy matter more by careful pricing strategies and by developing goodwill with consumers than with all the tricks in the barrel. Of course, the data itself can always be encrypted. But I don't want to trigger another discussion on that here.

Another phenomenon sneaking up on us is networking. Public networks and computer-based message systems (CBMS) are with us today, and many of us regularly use them. These systems will require some type of storage medium if copies are to be made of messages. But should these messages be stored in the form the host computer uses or one that the addressee can read? This is a good question. Under the new proposal, these formats would be compatible.

#### Getting Involved

Now, what can you as an individual user do to push for quick development of a standard for disk formats? For one thing, you can write to me. I promise to reply to everyone who writes, and I also promise to deliver your opinion to the project team that is being formed to solve this problem. I have been dubbed the convener or initial chairperson of the committee assigned to develop the new floppy-disk standard. That gives me a good chance to see that your opinions are heard.

How else can you help? If you or your employer can stand the cost, your direct participation is possible. An annual fee of \$150 handles the cost of getting you registered on the committee. You can even designate

someone as an alternate for yourself on that same \$150 fee. Being on the committee will also involve about 15 percent of your time, and you will annually incur travel costs for about four meetings of three days' duration each, invariably held on the other side of the continent from wherever you live. That expensive? Yes. How can anybody afford it? They are expecting eventual commensurate benefits.

My point is that you are not excluded from participating. All that is necessary is patience, interest, demonstrated ability, patience again, the ability to attend the various meetings, and yet more patience. And I am not teasing you about the amount of patience required. Standards are consensus documents, and that implies getting people with many differing opinions to agree. Can you imagine getting the adherents of some exotic threaded interpreter to agree with the BASIC crowd? Oh, you could imagine that. Then add a Pascal fan to the mix and stir in an assembly-code devotee. Can you imagine the scenario? I see it quite often.

Now for the bad news. When can we expect to see a disk-format standard? Mid-1985 is the current estimate. (Are you still there?) But as consumers you should be able to detect some effects of this work by the end of this summer. How? Software suppliers, at least the ones most involved, will start anticipating the standard. You will probably even see some eager ads proclaiming adherence to the standard while the standard itself will not yet have been drafted, let alone approved.

Why did it take so long to get a proposal? My feeling is that it was the result of a mistaken notion that the ANSI activities were only for the large mainframe computers. Frankly, some people in the mainframe computer field do indeed feel that way. I feel they shouldn't, but this is a free country. Similarly, a few microcomputer specialists around are opposed to standards. Why? Standards will let others connect to their products. For good reasons they might not want to allow that. I mentioned goodwill before. Goodwill is subjective. When trust goes away, group efforts do not succeed. Microcomputer users and mainframe users are merely on two sides of one computer industry. We must work to develop trust and goodwill. Both sides have a great deal to learn from each other.

Standards do not come about just for the fun of it or to irritate the affected parties. A standard is merely one possible solution to a recurring problem, but it should be a solution developed by consensus of the concerned parties. Some problems, of course, are bigger than others. It took quite a while before this one was seen as a problem. When this disk-format standard is behind us, we will wonder why we ever needed to discuss the matter in the first place.

Let me hear your needs for the interchange of disks. Unfortunately, of course, I will not be able to accept your information on a disk (unless, of course, you happen to send it on a 51/4-inch Flex2 disk for my 6800 system). But I hope, with your help, this situation will not last too much longer. ■



#### FRANKLIN ACE 1000 **\$CALL**

850 - \$159

5-5D - \$4399

802H - \$4450

800A - \$1290

APPLE CARDS 16K RAM - \$78 Z80 CARD - \$245 Smart Term - \$279 Videx Card - \$227 32K Atari Card - \$99 Clock CARD - \$120

**ALTOS** 

**NORTHSTAR** 

Advantage-\$2600 Horizon 64QD-\$2600

**TELEVIDEO** 

830 - \$155

5-15D - \$2249

802 - \$2599

806 - \$4950

#### SOFTWARE

All Major Brands - \$CALL Wordstar - \$235 Datastar - \$150 Calcstar - \$100 Spellstar - \$100

#### **DISK DRIVE**

Microsci Apple Dr. \$350 Percom Atari Dr. \$390 Percom IBM Dr. \$325 Fourth Dimension Dr. \$350

#### MODEMS

HAYS - MICROMODEM - \$285 HAYS - SMARTMODEM - \$219 HAYS - 1200 Baud - \$530

#### **DISKETTES/BOXES**

Elephant - \$20 Scotch - \$25 Dysan - \$35

GUARANTEED

w/Tractor & Grap. \$479 M84P - \$988 M84S - \$1090

#### **ANADEX**

9500A - \$1290 9501A - \$1290

#### CITOH

F-10P - \$1370 F-10S - \$1375 1550P - \$659 Prowriter 1550CD - \$709 8510AP - \$479 8510ACD - \$570

#### **DATASOUTH**

DS120 - \$595 DS180 - \$1175

#### DIABLO

630RO - \$1945 620 - \$1099

#### NEC

8023 - \$4607710 - \$2220

3550 - \$19253510 - \$1520

810 - \$1240 820 - \$1795

#### TERMINALS

#### **ADDS**

Viewpoint - \$485 **HAZELTINE** 

1500 - \$995**ESPRIT - \$498** 

#### **TELEVIDEO**

910 - \$569925 - \$718920 - \$735950 - \$899

ZENITH

Z19 - \$689Z89 - \$2129

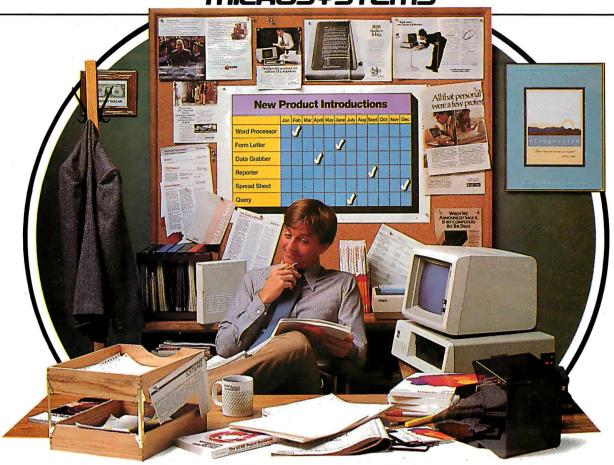
#### **MONITORS**

Color I - \$300 Amdek 300 - \$140 Amdek Color II - \$649 Color III - \$385 USI Amber - \$159 BMC Green - \$88

OTHER MAJOR BRANDS AVAILABLE **\$CALL** 

Customer Service 602-863-0759





# The Universal Operating System.\* Finally, you don't have to repeat yourself.

There was a time when, if you wanted to develop applications for more than one micro, you had to sink significant time and money into reprogramming. Time after time.

With the UCSD p-System\* from SofTech Microsystems, the industry's only Universal Operating System, those days are over. Whether it's an IBM PC or Displaywriter, an Apple, a DEC, an HP, an Osborne, a Philips, a Sage, a Tandy, or a TI, the p-System is por ble across virtually any micro made anywhere today.

#### At last, increase your productivity.

Because the programming you do is portable and reusable. Every time. For every micro. So you can broaden your customer base quickly. Because the p-System runs the same object code programs on virtually all 8 and 16-bit micros.

We know how much work you put into programming, so the p-System allows you to reuse program com
Once is Enough.

ponents. At last, you can *use* programs and utilities over and over again—instead of writing them over and over again. In fact, as much as 50% of the code used in one application can be reused on others.

#### Designed to be timeless.

With the p-System, you'll never have to worry about locking yourself into an OS that will some day lock you out of the market. Because the p-System's efficient, advanced design will let you grow with tomorrow's hardware, and let you continue to expand your product line.

You can develop higher quality applications faster, less expensively, more dependably and more efficiently. For the entire market.

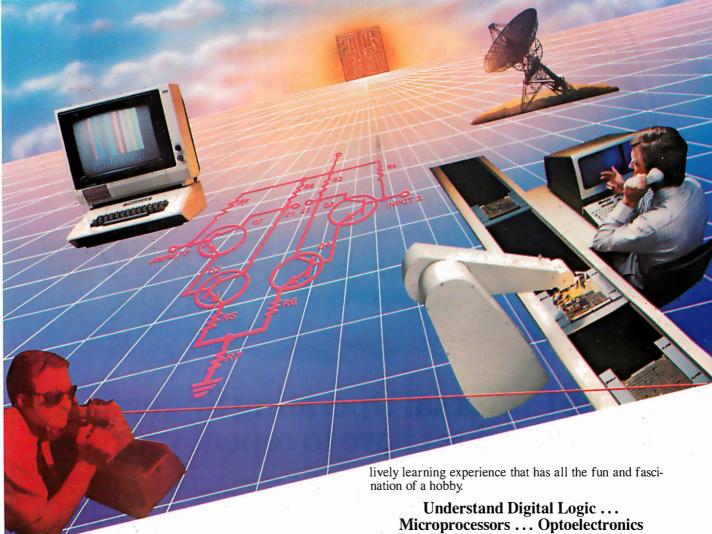
All at the same time. All on one micro. Finally, once really *is* enough.

Finally, For product information or information on how to get a copy of the p-System Application Catalog, call or write to us at SofTech Microsystems.

191

SofTech Microsystems • 16885 West Bernardo Drive • San Diego, CA 92127 • (619) 451-1230

#### MASTER THE "NEW ELECTRONICS" WITH McGRAW-HILL'S



Now you can meet the challenges of today's incredibly rapid changes in electronics quickly and easily. This professional level electronics learning series is as innovative as the circuitry it explains and as fascinating as the experiments you build and explore!

From digital logic to the latest 16-bit microprocessor, you master one subject at a time with McGraw-Hill Concept Modules sent to you one at a time, once a month, to make up the complete CONTEMPORARY ELECTRONICS SERIES. Each module of the fifteen in the Series is a unique blend of "hands-on" experience, interactive audio cassettes, and vividly illustrated printed support materials. Together they will prepare you for tomorrow's better jobs or advancement in your present position by staying current with today's electronics revolution. Professional in every respect, yet it's a

Here's an extraordinary opportunity to update your understanding of today's most important technological changes in electronics. You can start from scratch or use the Series to update yourself. You cover the latest integrated circuits, including TTL, CMOS, and ECL digital circuits; op-amps; phase-locked loops; microprocessors; and opto devices such as LEDs and LCDs.

#### **Perform Electronic Experiments**

With your first module you'll use the latest digital integrated circuits to build an oscillator circuit that demonstrates digital signals—verified visually by the flash of light emitting diodes (LEDs) and audibly by tones produced through the mini-speaker that is provided.

You'll know the differences (and similarities) between electronics and electricity, learn the concepts applicable to all electronic circuits. With the first module, you will be able to identify the major passive components, like resistors, capacitors, inductors, diodes and

transformers, and active components such as transistors and integrated circuits.

Each Concept Module goes right to the heart of the matter. You waste no time on extraneous material or outdated history. It's a fast, efficient, and lively learning experience, a nontraditional approach to the most modern of subject matter.

#### Construct and Use a Prototyping/Design Laboratory

What's more, when you reach the midpoint of your

#### YOU COVER EVERY SUBJECT IN CONTEMPORARY **ELECTRONICS**

- Digital logic
- Digital gates (TTL, CMOS, ECL, NMOS)
- Flip flops, counters and registers. Op-amps and applications
- Power supplies (plus IC and switching regulators)
- Combinational logic circuits (ROMs, PLAs, decoders, etc.)
- Circuit analysis. AC theory. LCR networks
- Transistors (bipolar and FETs), diodes, thyristors
- Integrated circuits (linear and digital)
- Oscillators and function generators
- Modulation and demodulation
- **Optoelectronics**
- Digital multimeters and scopes
- Microprocessors

Series, you will have constructed a professional Prototyping/ Design Laboratory which will become a valuable learning tool throughout the remainder of your studies. This Prototyping/Design Lab contains a signal generator, logic switches, pushbuttons, and LED indicators. It rivals professional instruments that are widely used in industrial laboratories for electronic design and development as well as testing and measuring. Because of its versatility, it is an instrument that you will use again and again, even after you have completed your Contemporary Electronics Series.

With each new module you'll receive a McGraw-Hill Action-Audio Cassette, a proven successful method of programmed, interactive instruction. Each tape creates a dynamic dialogue that not only quickly communicates the facts, but makes you feel that you're participating, as you respond to questions and listen to problems being solved.

Your ability to rapidly make this knowledge your



own is further aided by a strikingly original technique for using diagrams, illustrations, and schematics to drive home points made as you listen to the cassette. The same carefully indexed binder that contains this material also includes the instructions to guide you through hands-on experiments. Finally, having completed the Series, you can be awarded a Certificate of Achievement from the McGraw-Hill Continuing Education Center upon passing an optional final examination.

#### **Update Your Knowledge of** the New Electronics

This program is for you whether you're a scientist who can use electronics to improve or speed up your investigations... a teacher who'd benefit from a refresher in contemporary components, circuits and applications ... a manager or supervisor in an electronics related industry or business...an engineer in another field who finds electronics playing an ever more important role in your work . . . someone looking to find new direction in this wide open field...or the kind of person who wants to understand what's going on in the world around you.

McGraw-Hill's Contemporary Electronics Series offers you the quickest

and probably least expensive learning method available today, and the only one with "hands-on" experience.

#### No Risk, No Obligation

And we invite you to prove all this to your own satisfaction-without risk and without committing yourself in any way.

Return the replycard module and other mater-

With your first module you'll receive this professional solderless breadboarding system. It enables you to connect components and build electronic circuits easily and quickly. It's used throughout the series and can be used later to and we'll send you the first design, build and test your own circuits.

ials for a free 14-day examination. If you're not absolutely satisfied, and certain that this is an enjoyable as well as highly effective way to learn, simply return the module to us along with the unpaid bill and that will be the end of it.

If you wish to continue, we'll ship the remaining modules automatically, about once a month. for only \$19.95 each plus \$2.25 for shipping and handling. Remember, each module comes on the same 14-day free examination basis, with no obligation to pay for any module you don't want to keep.

Return the reply card now. It'll bring you the first module Contemporary Electronic Components and Circuits ... your first step in becoming an expert in the "new electronics." There's no risk or obligation.

If the card is missing write to:



Contemporary Electronics Series McGraw-Hill Continuing Education Center 3939 Wisconsin Avenue, NW Washington, DC 20016

# The Proposed ANSI BASIC Standard

### The committee asks for your opinion.

Ronald Anderson 2122 Riverside Ave. Minneapolis, MN 55454

Last June, BYTE published an article by Thomas Kurtz outlining the new proposed standard for the BASIC language (see "On the Way to Standard BASIC," June 1982 BYTE, page 182). It was the first article to describe the new proposal of the ANSI (American National Standards Institute) BASIC Committee, also called the X3J2 subcommittee. The proposed BASIC standard now must go before two other ANSI committees, X3 and SPARC (Standards Planning and Requirements Committee), before entering a formal period of public review. Committee approval is expected in early 1983, at which time the 120-day public review will begin.

At the end of this review period, the various ANSI committees will study the public feedback and decide whether or not to make revisions to the proposed standard and whether or not to recommend final approval. The ANSI X3J2 committee is current-

#### About the Author

Ronald Anderson is chairman of the ACM Special Interest Group on Computer Uses in Education and an associate professor at the University of Minnesota.

ly scheduled to meet again in July 1983 for this purpose.

Anticipating the process whereby anyone can register complaints or cheers, the Association for Computing Machinery (ACM) is informally collecting comments from members and from the public. ACM

# Acceptance of a proposed standard by ACM is by no means automatic.

is represented on the ANSI X3 committee by John A. N. Lee, and before he casts a final vote on the standard, he needs input from the membership, which currently numbers more than 60,000, and others.

Acceptance of a proposed standard by ACM is by no means automatic. For example, ACM voted against approval of the proposed Ada standard because most of the letters from members were very negative.

Because I am chairman of the ACM Special Interest Group on Computer Uses in Education (SIGCUE), I was appointed to coordinate the publicreview process of BASIC standards for ACM. I am collecting letters and pooling comments as they arrive.

A number of letters have come in, and in addition, a public forum on the subject was held at the annual meetings of the ACM in Dallas on October 27, 1982. This forum offered the public an opportunity for discussion following presentations by several members of the ANSI BASIC Committee, including Carlyle Phillips of Texas Instruments and Thomas Kurtz of Dartmouth College.

#### ANSI BASIC versus ANSI Minimal BASIC

The ANSI BASIC (X3J2) Committee has been working on a standard for eight years. During this prolonged effort, the members produced an earlier proposal, which was officially adopted in 1978. But that standard is a minimal subset and for that reason was called Minimal BASIC. Now that X3J2 is recommending another standard BASIC, some semantic confusion has developed. The current proposed version includes extensions far beyond most existing implementations of BASIC, yet X3J2 is simply calling it BASIC, not Extended

| WordStar® <b>\$299</b>                                                                                                                                                                                                              |                                                                                                 | dbase II™<br><b>5489</b>                                                                                                                                                                               |                        | -                                                                                                                                   | rCalc <sup>™</sup>  <br><b>89</b>                                                                                                                                                                                      |                                                   | tipla<br>99                                                                                                      | - 1                                                                                                                     | VisiCald \$189                                                                                           | _                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| WordStar®<br>MailMerge™<br>\$429                                                                                                                                                                                                    | WordStar®<br>dBASE II™<br>\$749                                                                 |                                                                                                                                                                                                        | Perfect Writer** \$229 |                                                                                                                                     |                                                                                                                                                                                                                        | SuperWriter** \$249                               |                                                                                                                  |                                                                                                                         | InfoStar™<br>\$299                                                                                       |                                                                                                                |
| ASPEN SOFTWARE' Grammatik Random House Proofreader Random House Thesaurus Univ. of Chicago Manual of Style ASHTON-TATE' dBase II DIGITAL RESEARCH' CBASIC FOX AND GELLER' Quickeode dUtil IUS'' Easywriter II Easyspeller Easyfiler | \$ 60<br>\$ 39<br>\$119<br>\$119<br>\$489<br>\$ 99<br>\$229<br>\$ 69<br>\$239<br>\$139<br>\$269 | MICROPRO® WordStar MailMerge WordStar, MailMerge WordStar, InfoStar InfoStar CaleStar DataStar SuperSort SpellStar ReportStar Update MICROSOFT'* Softeard Ram Card Videoterm (Videx'*) All Three Above | c C                    | \$299<br>\$149<br>\$429<br>\$529<br>\$549<br>\$299<br>\$ 89<br>\$149<br>\$149<br>\$229<br>A.I.L<br>\$259<br>\$139<br>\$269<br>\$509 | Enhancer II Basic 80 Basic Compiler MICROSTUF** Crosstalk PERFECT SOFI Perfect Writer Perfect Writer Perfect Cale Perfect Filer All Four Perfe PICKLES AND I CP M for TRS CP M for TRS Hard Disk OASIS** The Word Plus | Speller et Products rROUT** 6 Model II 6 Model I6 | \$119<br>\$275<br>\$295<br>\$135<br>\$229<br>\$139<br>\$329<br>\$149<br>\$279<br>\$695<br>\$169<br>\$189<br>CALL | Word<br>List I<br>SORC<br>Super<br>Super<br>Spell<br>TCS A<br>Gene<br>Acco<br>Acco<br>Payer<br>Player<br>VISIC<br>VisiC | rCale rWriter Guard ACCOUNTING'* ral Ledger unts Payable unts Receivable oll four Above ntory Management | \$149<br>\$129<br>\$189<br>\$249<br>\$129<br>\$99<br>\$99<br>\$99<br>\$289<br>\$99<br>\$289<br>\$189<br>\$CALL |

#### NOW, PAY LESS, AND GET GREAT SERVICE, TOO!

If you're looking for rock-bottom prices and fast, personal service, take a close look at 800-SOFTWARE.

Because we buy in volume, we're able to sell the products you want at prices that finally make some sense. But don't take our word for it. Compare prices and see for yourself!

#### OUR SERVICE CAN'T BE BEAT.

We take care of you like our business depends on it. Because it does

When you call 800-SOFTWARE, you get the fastest delivery available anywhere. Which means that every order is filled the day we get it. And that our unique

Order Tracking System's is on the job, keeping tabs on your order, every step of the way.

Our giant inventory one of the largest in the United States also assures you of the fastest possible service. Everything's in stock so you don't have to wait.

Technical support? Business software expertise? We've got it and it's the best you'll find anywhere.

But, put us to the test. Let us prove what we've proven to satisfied customers around the world.

That our prices are lower. That our service is better.

That there really and truly is a difference.

We look forward to your call.

#### FREE GIFT!

**GET 4 FLOPPY DISKETTES FREE** WITH ANY PURCHASE, IF YOU ACT NOW!

- ☐ Your choice of 5¼" or 8" □ Brand new

#### TO ORDER, CALL TOLL-FREE: 800-227-4587

In California, 800-622-0678 ог 415-644-3611

CA residents add sales tax.

OR WRITE: 800-SOFTWARE, INC.

185 Berry Street San Francisco, CA 94107









- ☐ Purchase orders accepted ☐ Prompt UPS 3 day Blue Label
- ☐ Call for shipping charges and our
- other low software prices.

  Now open Monday through
- Saturday. ☐ Dealer and quantity discounts
- available.
- ☐ Prices may change. © Copyright 800-Software, Inc. 1982



BASIC. Unfortunately, at the same time, some people refer to Minimal BASIC as ANSI BASIC, which strictly speaking it isn't.

To further confound communication, the ANSI BASIC proposal contains several major "optional" components, namely, graphics, editing, fixed decimals, and real-time commands. Therefore, it will not be possible to conform to the standard without having a computer equipped with graphics capabilities. Consequently, programs and implementations of ANSI BASIC that do or do not employ optional components may differ substantially, making program interchange difficult.

#### **Positive Reactions**

Before describing the negative comments and proposed revisions, I will summarize the comments favorable to the proposed standard. (I want to emphasize that these are preliminary comments, and a full summary will not be forthcoming until the spring or summer of 1983).

We have received several comments that are vague but supportive: for example, "it's about time," and "excellent." Other reactions were more specific. Philip Bouchard, Senior Programmer at the Minnesota Educational Computing Consortium, said, "I have long had a wish list (for BASIC). . . . At the top of my list are control structures, independent subroutines, and multiple-character variable names. For these features alone, the new standard is well worthwhile."

Most educators have been enthusiastic, largely because of the structured orientation of the new ANSI BASIC, which includes the following control structures:

IF. . .THEN. . .ELSE. . .END IF
DO UNTIL. . LOOP
DO WHILE. . LOOP
DO . .EXIT DO . .LOOP
SELECT. . .CASE. . .END SELECT

In addition, the user can enter external subroutines with a CALL statement. Line numbers can still be used, but under the new standard, programs can be written easily without the use of any internal line numbers.

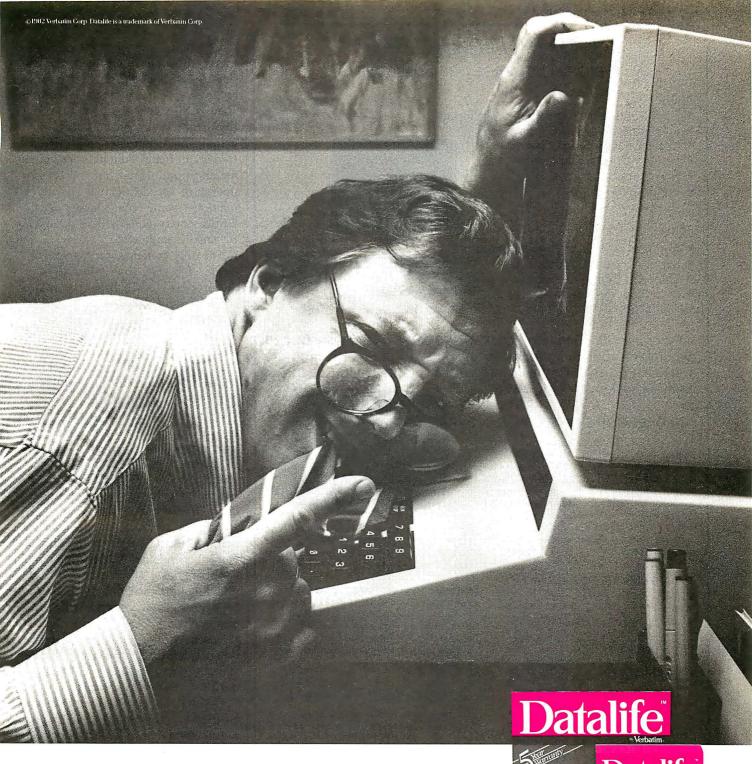
In fact, the version of ANSI BASIC that Dartmouth College is now developing does not even allow line numbers.

The graphics features of the proposed standard BASIC have received a cautious welcome from the educational computing community. While consensus on the need for more graphics exists, some teachers prefer turtle graphics as used in Logo languages. Others are skeptical about the success of a useful graphics standard in BASIC when the graphics hardware for existing microcomputers varies so much.

The proposed BASIC standard is especially welcomed by high school teachers who do not want to switch from BASIC to Pascal in their programming classes. An example of the problems currently faced by educators is the fury created by the announcement of the College Board AP (Advanced Placement) test in computer science because it is based upon Pascal. The College Board committee for computer science has said, however, that if there were a common version of BASIC in a structured form, an AP test could be developed for BASIC as well. If ANSI BASIC or a structured variation were to be widely implemented on educationally popular microcomputers, the language would probably become extremely popular in programming classrooms.

#### **Negative Reactions**

Not all educators are happy with the new BASIC proposal. Alfred Bork of the University of California, Irvine, exclaimed, "Why would one want to revise an old creaky language when there are better languages around?" His greatest objection to the ANSI BASIC proposal is the omission of data-type declarations. Professor Kurtz's response was that, first of all, without data typing it is much easier to write programs and, second, if BASIC had data typing, it would be indistinguishable from other languages such as FORTRAN. In some instances, simplicity has been the criterion guiding the formulation of the latest attempt to standardize BASIC.



# How to avoid becoming a casualty of the computer revolution.

The computer revolution is eliminating lots of work for everybody. Unfortunately, it's often work you wanted to keep.

Because of inconsistent or weak magnetic properties, some flexible disks can "forget" some or all of your information. But not if you're using Datalife® flexible disks. They're certified 100% error free and backed by a 5-year warranty. This means what you put on them stays, ready for instant retrieval.

So enjoy all the benefits of the computer revolution without suffering the painful loss of your information. Use Datalife by Verbatim, the world's leading producer of flexible disks.

For your nearest Verbatim dealer, call toll-free 800-538-1793; in California or outside the U.S., call collect (408) 737-7771.

#### COMPUTERSCOPE

#### DIGITAL STORAGE OSCILLOSCOPE

#### Features:

- High Resolution/High Speed A/D inputs
- 4 Channel Software Support
- Continuous or Single Sweep
- External Trigger Capability
- Waveform Storage on Disk
- Pretrigger Viewing
- Hardcopy Output

#### For:

- Automatic Test and Measurement
- Laboratory Data Acquisition
- Transient Signal Analysis
- Frequency Spectrum Analysis
- Digital Signal Conditioning and Enhancement



Purchase our complete *COMPUTERSCOPE* package for **\$3495** or combine your microcomputer with our APPLESCOPE hardware and SCOPE DRIVER software to create a total data acquisition and analysis system for only **\$695**.

#### APPLESCOPE INTERFACE

Choose either our original dual channel 8 bit APPLESCOPE-D2 or our new high resolution single channel APPLESCOPE-HR12 packages for \$695 or combine up to 4 APPLESCOPE-HR12 circuit cards in a high performance multichannel data acquisition system. All APPLESCOPE interfaces are fully programmable and include our SCOPE DRIVER software, external trigger adapter and BNC input connector.

#### The APPLESCOPE-D2 features

- Single or Dual channel trace
- 8 bit A/D converters
- 3.5 Mhz. Maximum Sample Rate (1.75 Mhz. for dual trace)
- 1024 Sample Memory

#### The APPLESCOPE-HR12 features

- 12 bit A/D converter
- 1 Mhz. maximum sample rate
- 2048 Sample Memory
- 4 Channel Software support

When combined with an APPLESCOPE interface our SCOPE DRIVER software creates a turnkey (NO user programming required) Digital Storage Oscilloscope including;

- Complete Trace Setup and Sweep Control
- Digital Voltage readout and real time DVM
- Waveform storage and retrieval from disk
- Hardcopy (Screen Dump)
- Digital Signal Conditioning
- 16,384 Sample Memory (DMA to Apple Ram under 28 Khz.)
- Waveform Manipulation (Scroll, Scale and Offset)

198

- MATH PACK (Add, Subtract, Invert or Multiply input channels)
- AUTOMATE User program interface for easy access to SCOPE DRIVER routines



Optional data analysis software from our SCOPE DRIVER LIBRARY may be purchased to make your COMPUTERSCOPE a true data analysis instrument including;

- Frequency Spectrum Analysis (a FAST FFT)
- Harcopy (Continuous Strip Chart Record)
- Autocorrelation / Box Car Integration
- Pulse Rate / Frequency Measurement
- Post Stimulus Time Histogram
- Time Interval HistogramSignal Averager

#### COMPUTERSCOPE PACKAGES

For those persons looking for an alternative to expensive dedicated instruments we offer complete *COMPUTERSCOPE* packages beginning at \$3495 which includes;

- 48K Apple II+ or 64K Franklin Ace 1000
- Disk Drive with DOS 3.3 Controller
- High Resolution Green Screen Monitor
- High Resolution Graphics Printer
   APPLESCORE D3 or LIP13 Paging
- APPLESCOPE D2 or HR12 Package
- Scope Driver Library
- Scope Probes

Visa

Call or write for our free data sheets or better yet purchase our comprehensive demonstration diskette for \$10 to find out why our COMPUTERSCOPE is the state of the art Digital Storage Oscilloscope for the 80's.

#### R.C. ELECTRONICS INC.

5386 Hollister Ave. #D Santa Barbara, CA 93111 (805) 968-6614 Telex 295281



Ironically, one of the most common complaints about the newly proposed ANSI BASIC is that it is so complex (because it incorporates all standard features and some optional ones) that its implementation on an actual microcomputer will be extremely difficult without a very large memory and faster microprocessor operating speeds. If this is true, it may be some time before ANSI BASIC interpreters will be available for small computers.

The only contemporary implementation of BASIC that comes close to the proposed ANSI BASIC standard is the new VAX BASIC from Digital Equipment Corporation. Until an extensive BASIC such as that proposed by X3J2 is up and running on a small-scale microcomputer, many persons will continue to doubt the viability of the proposed ANSI BASIC.

A few technical criticisms have been registered. For example, one programmer complained about the replacement of ON ERROR GOTO with WHEN EXCEPTION USE, which he perceives as semantically more cumbersome.

Another technical comment came from a BASIC product specialist at Data General (see "Letters" column, October 1982 BYTE, page 18). He pointed out how a DIM statement can be bypassed inadvertently in a program. When bypassed, arrays cannot be used to test conformity to the bounds defined by the array dimension. A minor addition to the standard could solve the problem.

Despite the apparent comprehensiveness of the ANSI BASIC proposal, several people asked that the standard go even further. One comment was, "Why can't a disk-exchange format be established for 5½-inch disks? The committee will say this is out of their territory, but why have a language standard if I have to keyboard the program into each new microcomputer I have to run it on? . . . A software format standard is the answer."

Another expansionist request was for a more powerful editor and consistent operating-system protocols. The proposed standard has an optional editing subsystem; however, it is limited and does not even specify normal text-editing functions such as character inserts and deletes. If every BASIC environment had identical syntax for editing commands as well as for operating-system commands, computing in a multimachine context would be considerably more userfriendly.

#### Philosophy of a Standard

The underlying philosophy of the proposed BASIC standard seems slightly different from that of other languages, such as FORTRAN, in that numerous extras are defined as optional modules rather than as miscellaneous extensions. Their inclusion in the official standard implies that they are desirable but not essential. Confusion may result because every implementation will almost certainly be a partial implementation, and conformity to the standard will be less meaningful because each implementer must also specify the optional features of his or her version of BASIC as well as the departures from the core standard. This is a major criticism of the proposed ANSI BASIC in that it may not solve software-incompatibility problems. With so many features defined as optional, it may be difficult to encourage programmers to clearly demarcate optional and nonstandard commands within a program.

Professor Kurtz replies that the major goal of the new ANSI BASIC is student interchange, not program interchange. "We want students," he argued, "to be able to use what they've learned elsewhere and, without total retraining, continue their learning experiences." To the extent that this philosophy is shared, it would be more appropriate to call the standard a model rather than a rule by which to measure conformity.

Several companies (e.g., Digital Equipment Corporation and Hewlett-Packard) have committed themselves to adding new BASIC features in the spirit of the proposed ANSI standard. The new VAX-11 BASIC Version 2.0 contains most of the proposed features. Dartmouth College is implementing the ANSI standard but adding extensions and deviations (e.g.,

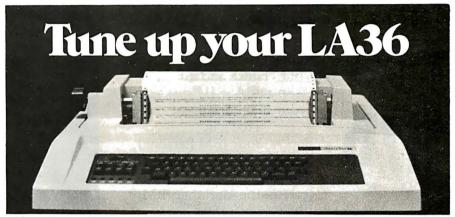
line numbers are not allowed as statement identifiers). These projects show that having an ANSI BASIC standard is feasible, but they also forecast a continuation of diversity among BASIC implementations.

The new standard appears to be more loosely defined than most other language standards; however, the intended purpose seems not so much to produce uniformity among versions of BASIC as to steer BASIC implementers toward a common target and thus increase the chances that any given BASIC program will be usable with different versions of BASIC.■

#### What's Your Opinion?

To date only a few reactions have been heard. Far more grass-roots opinions are needed. If you are reading this before the summer of 1983, you still have time to influence the verdict on ANSI BASIC. Send your comments to the author of this article so that they can be vooled and channeled into the decision process.

Copies of the "Draft Proposed Standard for BASIC" are available from X3 Secretariat, CBEMA, 311 First St., NW. Suite 500, Washington, DC 20001.



#### The DS120 Terminal Controller makes your LA36 perform like a DECwriter® III.

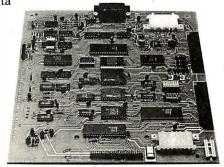
The Datasouth DS120 gives your DECwriter® II the high speed printing and versatile performance features of the DECwriter® III at only a fraction of the cost. The DS120 is a plug compatible replacement for your LA36 logic board which can be installed in minutes. Standard features

- 165 cps bidirectional printing
- Horizontal & Vertical Tabs
- Page Length Selection
- 110-4800 baud operation
- 1000 character print buffer
- X-on, X-off protocol
- Self Test

- RS232 interface
- 20 mA Current Loop interface
- Top of Form
- Adjustable Margins
- Double wide characters
- Parity selection
- Optional APL character set

Over 5,000 DS120 units are now being used by customers ranging from the Fortune 500 to personal computing enthusiasts. In numerous installations, entire networks of terminals have been upgraded to take advan-

tage of today's higher speed data communications services. LSI microprocessor electronics and strict quality control ensure dependable performance for years to come. When service is required, we will respond promptly and effectively. Best of all, we can deliver immediately through our nationwide network of distributors. Just give us a call for all the details.



datasouth computer corporation

4216 Stuart Andrew Blvd. • Charlotte, North Carolina 28210 • 704/523-8500

# How to mak work like a

First, neatly cut out the "370" label.

Now, when nobody's looking, nonchalantly tape it to your terminal, just under the "IBM," as if it really belonged there.

Then wait for your chance and quickly

slip a dBASE II™ disk into your main drive.

r main urive. That's it.

Your IBM Personal Computer is now ready to run a relational database system, the kind that IBM

put on their mainframes last year.

And you're ready with more data handling power than you would have dreamed possible before dBASE II.

#### You'll wonder how you managed without it.

You'll find that dBASE II, because it's a <u>relational</u> database management system (DBMS), starts where file handling programs leave off.

dBASE II handles multiple databases and simplifies everything from accounting to department staffing to monitoring rainfall on

the Upper Volta.

With a word or two, you CREATE databases, APPEND new data instantly, UPDATE, MODIFY and REPLACE fields, records and entire databases. Organize months worth of data in minutes with the built-in REPORT. Do subfield and multi-field searches, then DISPLAY some or all of the data for any condition you want to apply.

And you've just begun to tap the power of dBASE II.

#### Easy to look at, easy to use.

Input screens and output forms couldn't be easier—just "paint" your format on the CRT and what you see is what you'll get.



You can do automatic calculations on fields, records and databases, accurate to 10 digits.

And you can use dBASE II interactively for answers right now. Or save your instructions, then repeat everything with two words: DO Manhours, DO ProjectX, DO whatever has to be done.

#### Use dBASE II to help make your choice:

If you've got a 96k IBM PC, send us \$700 and we'll send you a copy of dBASE II to use free for 30 days.

# e your micro mainframe.



Instead of just poring over a manual, run it and make sure that it does what you need done.

Then if you find it isn't right for you, send it back and we'll return your money, no questions asked.

But if you do that, you'll have to remove that label. Because nothing short of a mainframe works like dBASE II.

Call (213) 204-5570 today or drop by your local computer store for the rest of the story. Ashton-Tate, 9929 Jefferson Blvd.,

Culver City, CA 90230.

# Ashton-Tate

Circle 33 on Inquiry card. ©1982 Ashton-Tate CP/M is a registered trademark of Digital Research

IBM, APPLE and ATARI USERS

## CompuShack announces



| Graphmagic                 | . \$79.00 |
|----------------------------|-----------|
| Infocom<br>Zork I          | \$29.95   |
| Zork II                    |           |
| Deadline                   |           |
| Information Unlimited      | . 505.55  |
| Easy Filer                 | \$200 nn  |
| Easy Planner               | \$150.00  |
| Easy Speller               |           |
| Easy Writer II             | 5139.00   |
| Micro Lab - Tax Manager    |           |
| Micro Pro                  | 3199.00   |
| Micro Pro                  |           |
| Wordstar                   | \$299.00  |
| Mailmerge                  | \$99.00   |
| Peechtree                  |           |
| General Ledger             |           |
| Accounts Receivable        | \$499.00  |
| Accounts Payable           | \$499.00  |
| Sir Tech - Galactic Attack | \$29.95   |
| VisiCorp                   |           |
| * 256K Visicalc            | \$100 nn  |

#### **SOFTWARE FOR YOUR ATAR! 400/800** PERSONAL COMPUTER

| Centipede                               |         |  |
|-----------------------------------------|---------|--|
| Pac-Man                                 | \$35.95 |  |
| Blackjack                               | \$15.95 |  |
| Caverns of Mars                         | \$32.95 |  |
| APEX CASSETTES                          |         |  |
| Avalanche                               | \$19.95 |  |
| Outlaw/Howitzer                         | \$19.95 |  |
| 747 Landing Simulator                   |         |  |
| Eastern Front                           | \$23.95 |  |
| Dog Daze                                | \$19.95 |  |
| Reversi II                              | \$19.95 |  |
| Blockbuster                             | \$15.95 |  |
| 7-Card Stud                             | \$15.95 |  |
| Downhill                                | \$19.95 |  |
| Video Math Flash Cards                  | \$15.95 |  |
| Letterman                               |         |  |
| Wordmaker                               |         |  |
| Cubbyholes                              | \$19.95 |  |
| DISKETTES                               |         |  |
| Data Management System Family Cash Flow | \$19.95 |  |
| Family Cash Flow                        | \$19.95 |  |
| Family Budget                           |         |  |
| Advanced Music System                   | \$25.95 |  |
| Eastern Front                           | \$25.95 |  |
| Supersort                               | \$19.95 |  |
|                                         | \$19.95 |  |

#### SOFTWARE FOR YOUR APPLE II + ART-SCI INC.

| Magic Window                   | <br>      |  | \$79.00  |
|--------------------------------|-----------|--|----------|
| Magic Mailer                   |           |  | \$49.00  |
| Magic Words                    |           |  |          |
| Magic Pak — Includes All Three |           |  | \$157.00 |
| Magic Window II                | <br>• • • |  | \$119.00 |
| ASHTON-TATE                    |           |  |          |
| Dbase II (Apple)               |           |  |          |
| Dbase II (Apple 48K)           |           |  | \$299.00 |

We Are The Systems Specialist

#### CONTINENTAL SOFTWARE CPA I General Ledge \$199.00 CPA II Accounts Receivable \$199.00 CPA III Accounts Payable \$199.00 CPA IV Payroll \$199.00 CPA V Property Management \$399.00 The Users Accountable \$59.95 The Home Accountant ...... The Home Accountant Plus ... **DAKIN 5 CORPORATION** Depreciation Planner ...... \$299.00 Budget Planner ...... \$119.00 Business Bookkeeping System ...... \$299.00 Math Magic \$69.95 LIGHTNING SOFTWARE **MICRO PRO** MICROSOFT Word Star Customization Notes \$299.00 Time Manager ..... \$129.00 Fortran \$159.00 A.L.D.S \$99.00 Wordstar ..... \$199.00 Super Sort ...... \$129.00 Basic Compiler ..... \$299.00 muMath/muSimp ..... \$185.00

### **SOFTWARE FOR YOUR APPLE II +**

Spell Star ..... \$129.00 
 Calc Star
 \$129.00

 Word Star Training Guide
 \$19.95

 Word Star Update
 \$69.00
 COBOL .....\$499.00 M/SORT ....\$149.00

TASC ....... \$149.00 Multiplan (Native Apple) \$199.00 Multiplan ..... \$199.00

.. \$75.00 S189.00

| ON-LINE SYSTEMS                         |             |                                                   |          |  |  |  |
|-----------------------------------------|-------------|---------------------------------------------------|----------|--|--|--|
| Screen Writer II                        | 19.00       | TWARE PUBLISHING<br>COMPANY                       |          |  |  |  |
| The Dictionary Speed-ASM Expediter II   | 29.95 Perso | onal Filing System .<br>onal Report System .<br>h | \$65.00  |  |  |  |
| Memory Management II                    | 39.00 SOR   | CIM CORPORATION                                   |          |  |  |  |
| Lisa 2.5                                |             | rcalc                                             |          |  |  |  |
| PEECHTREE SOFTWARE General Ledger       |             | Pac                                               | \$69.00  |  |  |  |
| Accounts Receivable                     |             | Master                                            |          |  |  |  |
| Accounts Payable \$                     | 99.00 DB    | Utility Pack II                                   |          |  |  |  |
| Inventory Si                            |             | hic Processing stem Standard                      | \$49.00  |  |  |  |
| Peachcalc Electronic Spreadsheet        | Grap        | hic Processing                                    |          |  |  |  |
| Telecommunications Si                   |             | em Professional TEMS PLUS                         | \$69.00  |  |  |  |
| Spelling Proof Reader \$2               | 50.00 Gen   | eral Ledger \$                                    | 249.00   |  |  |  |
| Mailing List Manager SZ<br>Peachtext SZ |             | AR/AP                                             |          |  |  |  |
| SENSIBLE SOFTWARE Back It Up            | VISI        | CORP                                              |          |  |  |  |
| Back It Up                              |             | iles S<br>ktop Plan S                             |          |  |  |  |
| Disk Organizer II                       | 19.95 Visip | olot                                              | 149.00   |  |  |  |
| Multidisk Catalog                       |             | dex                                               |          |  |  |  |
| Sensible Speller                        | 89.95 Visis | chedule                                           | \$219.00 |  |  |  |
| Sensible Speller Supertext<br>Format    | Busi        | ness Forecasting<br>Model                         |          |  |  |  |
| Tormat                                  |             |                                                   | 5/5.00   |  |  |  |

#### CompuShack

Business Home Computers

2630-H Walnut Avenue, Tustin, CA 92680 (714) 730-7207 Telex 18-3511 Ans Bck ESMA

Asteroids

# NAPLPS: A New Standard for Text and Graphics

### Part 1: Introduction, History, and Structure

A close look at an important and controversial new communications standard.

Personal computers have a great deal in common. Several of them use the same microprocessor. Most have the same language in read-only memory (BASIC). And all use more or less the same keyboard. But there is a tremendous variation in the ways various computers handle graphics.

In order to mass-produce graphics software or to mass-distribute graphics information (as in videotex and teletext), a standard for graphics information is needed.

The North American Presentation-Level-Protocol Syntax (NAPLPS, or "nap-lips") is a method for encoding visual information in a standard and compact manner, which can then be exchanged among people using a variety of different computer systems. Like the well-established American Standard Code for Information Interchange (ASCII), NAPLPS is a set of rules and conven-

#### About the Authors

Jim Fleming and William Frezza are members of the ANSI X3L2 Committee on Character Sets and Coding. Mr. Fleming is also working on Chemical Bank's Pronto home-banking project.

Jim Fleming Unir Corporation Suite 106 5987 East 71st St. Indianapolis, IN 46220

William Frezza Jerrold Division General Instrument Corporation 2200 Byberry Rd. Hatboro, PA 19040

tions describing how data bytes of information should be formatted, as well as a set of guidelines describing what should be displayed when properly formatted data bytes are received by a terminal.

Unlike ASCII, however, the major emphasis in NAPLPS is on the communication of information in a two-dimensional graphics format. Graphics and textual information can be represented in a variety of modes, colors, and styles. Facilities are also provided that allow a terminal user to interact with the two-dimensional visual display in an extremely free-form manner.

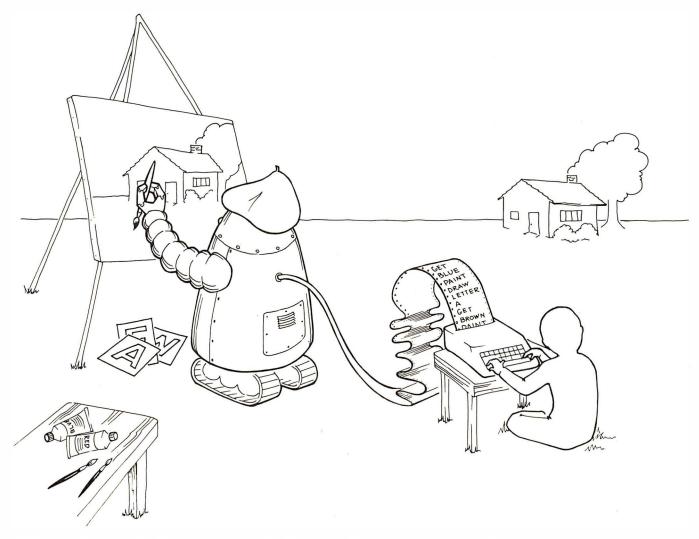
NAPLPS also includes a method for minimizing the amount of infor-

mation that must be sent over communications lines. Techniques are provided that allow extensions to be added to NAPLPS at some future time without affecting existing features.

The basic concept of NAPLPS can be illustrated by the cartoon in figure 1 on page 204. It shows a robot artist being fed a stream of commands that are used to paint a picture. At the robot's disposal are pens of various colors, spray paints, character templates, and all the other items found in an art studio.

With various commands, we can direct the robot's arm to any area of the canvas we desire. We can instruct the robot to use any of several standard colors, or we can tell it to create a new color from the existing ones. When text is needed, the robot selects the proper-size template for the desired letters, grabs a can of spray paint, places the template on the canvas, and paints a character.

The goal of this system is that the beauty and complexity of a picture should be limited only by the imagination and skillfulness of the person (or program) creating the commands being fed to the robot.



**Figure 1:** A stylized representation of how the NAPLPS system works. The programmer or artist creates a list of graphics commands, e.g., "get red pen," "draw a circle." The robot (or NAPLPS decoder) then interprets these commands and uses various drawing instruments such as pens, brushes, rulers, and compasses to draw on the canvas (display screen). If a text character is specified, the robot uses an appropriate template for that character.

This article is the first in a series of articles on NAPLPS. In this part, we give an overall perspective of NAPLPS, describing its history and background, as well as its structure and major features. In subsequent parts, we will cover the basic text and graphics features of NAPLPS from a bit and byte perspective, describe some of its more advanced features, and explore the future of NAPLPS with an emphasis on personal computers, local and regional area networks, and distributed processing.

#### History and Background

NAPLPS has its roots in videotex, a much-discussed system of large host computers and low-cost, userfriendly graphics terminals. Because of the large potential market for these terminals, many groups around the world have been designing such systems for use in homes, offices, and public areas. As shown in figure 2 on page 206, a basic videotex system consists of a host computer with a database of information, a communication network, and a terminal. The terminal users request information from the database, and the desired information is sent back to the terminal, where it is interpreted and displayed.

Unfortunately, all the experimental systems designed around the world used different coding schemes. As is the case with most languages, the various coding schemes had different strengths and weaknesses. Some were more efficient than others; some were more easily decoded by terminals;

some preserved the "conceptual" content of the information; and some were tailored to particular hardware configurations.

At the time NAPLPS was developed, videotex coding schemes could be divided into two major groups. In one group were schemes that were similar to the approach used in the British Prestel system, which was the first videotex effort in the world. The other group of schemes is best represented by the Telidon system developed in Canada as an alternative to the Prestel system. As is the case with many developments in the computer field, being first does not imply being the best.

Table 1 on page 210 compares Prestel-like systems and Telidon-like systems. Without going into all the

# Our Prices Will Get Your Attention. Our Service Will Keep It.

ORDER NO. DESCRIPTION

LIST AEI PRICE

ORDER NO. DESCRIPTION

LIST AFI PRICE

ORDER NO DESCRIPTION

LIST AEI PRICE

| <b>TELEVIDEO</b> | <b>SYSTEMS</b> |
|------------------|----------------|
|------------------|----------------|

| TS-802              | Integrated Single User                  |              |              |
|---------------------|-----------------------------------------|--------------|--------------|
| TS-802H             | Computer                                | 3295         | 2632         |
| 13-002H             | Computer                                | 5995         | Call         |
| IS-1602G            | 16 Bit 802 Type Computer                | 4495         | Call         |
| TS-1602GH           | 16 Bit 802H Type                        | ,            |              |
| TC 004 00           | Computer                                | 6995<br>7195 | Call<br>Call |
| TS-806-20<br>TS-816 | Multi-User Computer Multi User Computer | 8995         | Call         |
| TV-910-P            | Televideo 910 Plus                      | 699          | 573          |
| TV-910              | Televideo 910                           | 699          | 573          |
| IV-912              | Televideo 912C                          | 925          | 685          |
| TV-920              | Televideo 920C                          | 995          | 737          |
| TV-925              | Televideo 925                           | 995          | 745          |
| TV-950              | Televideo 950                           | 1195         | 921          |
| TV-9010             | Second Page Option                      |              |              |
|                     | 912/920                                 | 80           | 50           |
| 1V-9050             | One Additional Page for                 | 95           | 62           |
| TV-9051             | 925/950<br>Three Additional Pages       | 93           | 02           |
| 10-7001             | for 950                                 | 120          | 95           |
| TV-MM               | For AnyTelevideoTerminal                | 60           | 53           |
| TS-24-001           | TeleSolutions WordStar                  | 00           |              |
|                     | · CalcStar                              | 790          | Call         |
| TS-100              | WordStar                                | 495          | 280          |
| TS-150              | SpellStar                               | 250          | 154          |
| TS-200              | SpellStarAse<br>MailMergeSprNASE        | 250          | 154          |
| TS-300              | Dalasiai                                | 295<br>250   | 238<br>164   |
| TS-400 TS-1000      | Supersort                               | 145          | 128          |
| TS-806H/20          | 20 MB Expansion for TS-806              | 3600         | 2948         |
| TS-TW               | Telewriter - NEC 3500                   | 2195         | 1629         |
|                     |                                         |              |              |

#### **NEC PRINTERS**

| NE-3510-1  | NEC 3510SpinwriterR/O<br>Serial 35 CPS | 1895 | 1500 |
|------------|----------------------------------------|------|------|
| NE-3515-1  | NEC 3515Spinwriter R/O                 | 1070 | 1000 |
|            | Serial Diablo Compatible               | 1925 | 1594 |
| NE-3530-1  | NEC 3530 Spinwriter                    | 2190 | 1764 |
| NE-3550-1  | NEC 3550 SpinwriterR/O                 |      |      |
|            | Parallel IBM Compatible.               | 2350 | 2065 |
| NE-35-TRAC | Bi-directional Tractor                 | 265  | 237  |
| NE-7710-1  | NEC 7710SpinwriterR/O                  |      |      |
|            | Serial 55 CPS                          | 3085 | 2523 |
| NE-7715-1  | NEC 7715SpinwriterR/O                  |      |      |
|            | Serial Diablo Comp                     | 3165 | 2600 |
| NE-7720-1  | NEC 7720 SpinwriterKSR                 |      |      |
|            | Serial 55 CPS                          | 3610 | 2917 |
| NE-7725-1  | NEC 7725 Spinwriter KSR                |      |      |
|            | Serial Diablo Comp                     | 3710 | 3041 |
| NE-7730-1  | NEC 7730 Spinwriter                    | 3085 | 2546 |
| NE-PC-8023 | Parallel                               | 695  | 506  |
|            | PLUS OTHER ACCESSORIES                 |      |      |
|            |                                        |      |      |

#### SOFTWARE AVAILABLE

| Cromemco CP/M 5¼"                                                                                                                                                                                  |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Eagle CP/M 5¼"                                                                                                                                                                                     |    |
| Heath Zenith CP/M 5½"                                                                                                                                                                              | ı  |
| Hewlett Packard 87 CP/M 5½" IBM P.C. CP/M 86 FOR                                                                                                                                                   |    |
| IBM P.C. DOS                                                                                                                                                                                       |    |
| NEC CP/M 5½"                                                                                                                                                                                       | 11 |
| Northstar Horizon CP/M 5¼" Ohio Scientific C-3 CP/M 5½" PRICIN                                                                                                                                     | ~  |
| Osborne CP/M 51/4"                                                                                                                                                                                 |    |
| Otrona CP/M 5¼"                                                                                                                                                                                    |    |
| Sanyo 1000 CP/M 5½"                                                                                                                                                                                |    |
| Sirius Victor 5¼"                                                                                                                                                                                  |    |
| 0.0                                                                                                                                                                                                |    |
| Software for 8086 Computers                                                                                                                                                                        |    |
| Software for 8086 Computers. Standard CP/M 5½". Superbrain 5½". Timex/Sinclair ZX81 TRS-80 Cassette Models I & III. TRS-80 Diskette Models I & III. TRS-80 Model II CP/M. Televideo CP/M 5½".      |    |
| Software for 8086 Computers. Standard CP/M 5½" Superbrain 5½". Timex/Sinclair ZX81 TIRS-80 Cassette Models I & III TIRS-80 Diskette Models I & III TIRS-80 Model II CP/M Televideo CP/M 5½" Vic 20 |    |
| Software for 8086 Computers. Standard CP/M 5½". Superbrain 5½". Timex/Sinclair ZX81 TRS-80 Cassette Models I & III. TRS-80 Diskette Models I & III. TRS-80 Model II CP/M. Televideo CP/M 5½".      |    |

#### STAR MICRONICS

| DP_8//80_TP | 80 Column Dot Matrix    |     |      |
|-------------|-------------------------|-----|------|
| DI -0400-11 | Printer - Parallel      | 449 | Call |
| DP-8480-TS  | 80 Column Dot Matrix    |     |      |
|             | Printer - Serial        | 464 | Call |
| Gemini-10   | 10" Carriage - Paratlel | 499 | Call |
| Gemini-15   | 15" Carriage - Parallel | 649 | Call |
|             | Serial Interface Card   | 85  | Call |
| DP-8240     | 40 Column Dot Matrix -  |     |      |
|             | Parallel or Serial      | 250 | Call |

#### NORTHSTAR

| NS-94404 | Adv-2Q-64K Computer 3599    | Call |
|----------|-----------------------------|------|
| NS-97404 | Adv-1Q-64K-HD-5             |      |
|          | Computer                    | Call |
| NS-94401 | Hrz-2Q-64K Horizon 3599     | Call |
| NS-97401 | Hrz-1Q-64K-HD-5MB 4999      | Call |
| PL       | US OTHER NORTHSTAR PRODUCTS |      |
|          |                             |      |

#### OKIDATA

| OK-82A   | Okidata Microline 82A |      |      |
|----------|-----------------------|------|------|
|          | with Tractor Feed     | 719  | 486  |
| OK-83A   | Okidata Microline 83A | 1195 | 713  |
| OK-84A-P | Okidata Microline 84A |      |      |
|          | - Parallel            | 1395 | Call |
| OK-84A-S | Okidata Microline 84A |      |      |
|          | - Serial              | 1495 | Call |
| OK-G-82  | Okigraph I for 82A    | 99   | 36   |
| OK-G-83  | Okigraph I for 83A    | 99   | 36   |
| OK-2K    | 2K Buffer/Serial BD   |      |      |
|          | all Models            | 140  | 119  |
|          |                       |      |      |

#### **FEBRUARY SPECIALS**

| Z-90-80 Plus Z-37 CPU · Drives CP/M DOS MBasic SuperCalc                              | LIST   | FEBRUARY<br>AEI PRICE |
|---------------------------------------------------------------------------------------|--------|-----------------------|
| · supercuic                                                                           |        | \$3128                |
| Z-90-82 Computer 64K RAM,<br>ID 160K Drive · CP/M DOS<br>· MBasic · SuperCalc         | \$2799 | \$1989                |
| Limited Quantity of MX80<br>Cassette Ribbons. Special<br>Price. Limit 3 per customer. |        |                       |
| While supply lasts                                                                    | ., \$1 | 4 \$7                 |

#### ZENITH

| <b>ZV</b> M-121 | Green Screen Monitor     | 160  | 99   |
|-----------------|--------------------------|------|------|
| Z-19-CN         | Z-19 Terminal            | 895  | 672  |
| ZT-1-A          | Auto-Dial Terminal       | 699  | 526  |
| Z-25-AA         | Z-25 Dot Matrix Printer  | 1499 | 1198 |
| Z-89-81         | Z-89 Computer System     | 2499 | 1952 |
| Z-90-82         | Z-90 Computer System     | 2799 | 2176 |
| Z-89-X          | Z-89 w/o Integral Drive  | 2495 | 1749 |
| Z-90-80         | Z-90 w/o Integral Drive  | 2895 | 1950 |
| Z-37            | Z-37 Dual 5" Disk Drives | 1995 | 1593 |
| Z-87-89         | Z87 Dual 5" Disk Drives  | 999  | 898  |
| Z-87-90         | Same Disk add 400K       |      |      |
|                 | to Z-90                  | 999  | 898  |
| ZS-67           | Z-67 Winchester -        |      |      |
|                 | Floppy Drive             | 5995 | 4747 |
| Z-47-DA         | Z47 Dual 8" Disk Drives  | 3695 | Call |

PLUS: MORROW · ALTOS · **NEC PERSONAL . EAGLE** 

#### MANNESMANN TALLY

|                 |                            | No. of |      |
|-----------------|----------------------------|--------|------|
| MT1605          | Serial 200 CPS             | 1695   | 1441 |
| MT1602          | Parallel 200 CPS           | 1695   | 1441 |
| MT1805          | Serial - 200 CPS or 50 CPS | 1995   | Call |
| MT1802          | Parallel - 200 CPS         |        |      |
|                 | or 50 CPS                  | 1995   | Call |
| M <b>T</b> 1602 | S or P - 160 CPS           | 990    | 809  |
|                 |                            |        |      |

PLUS: ANADEX · C-ITOH · DATA SOUTH · TI · DIABLO · COMREX ALSO AVAILABLE:

MODEMS · DISKETTE STORAGE BOXES · DISKETTES · CLIPSTRIP · RIBBONS

#### **GUARANTEE**

- PROVEN PRODUCTS
- · SYSTEM DESIGN HELP
- BENCH TESTING AND CONFIGURING
- · TECHNICAL SUPPORT STAFF
- · SERVICE AFTER SALE:

(800) 854-7635 TECHNICAL SERVICE SUPPORT We will pay the freight - both ways - for repair

on verified returns within 30 days of sale.

TERMS AND CONDITIONS

Prices change daily. Call for current pricing and availability. Prices based on prepaid cash orders We accept: cashiers checks, money orders, bank wires, or personal checks (10 days to clear). C.O.D.— standard charges plus 2% handling for orders outside California. Mostercharge & Visa—5% handling. California residents add 6% sales tax.



Prices change daily call for current pricing.

CALL TOLL FREE:

800-854-7635

IN CALIFORNIA CALL: (619) 562-7571

AUTOMATED EQUIPMENT, INC.

8775 Olive Lane, Suites I & J - Santee, CA 92071

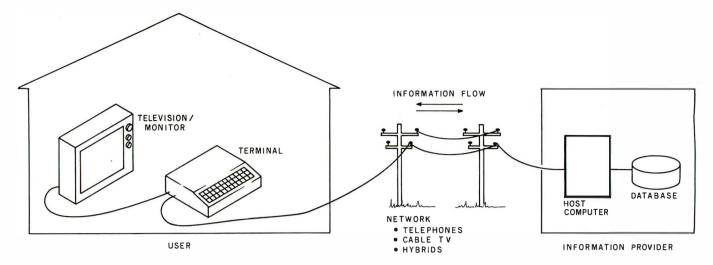


Figure 2: A diagram of a typical videotex system. Videotex is defined here as two-way communication of textual and graphical information between a low-cost, user-friendly terminal and a large, central host computer. Communication can be by telephone lines, television cables, or a hybrid system using a broadcast television channel for information sent from the host computer and using telephone lines for information sent from the terminal.

technical, emotional, and political history, suffice it to say that NAPLPS was designed using Telidon-like systems as a base.

In May 1981, AT&T created a bit of commotion by releasing documentation for a new Telidon-like scheme called PLP (Presentation-Level Protocol) at the Videotex '81 conference in Toronto. Since that time, continuous efforts have been underway in various standards groups to adopt PLP.

NAPLPS is a standard version of PLP that resulted from a joint effort by the American National Standards Institute (ANSI) and the Canadian Standards Association (CSA). Copies of the draft proposed NAPLPS standard (document #BSRX3.110-198X) can be obtained from CBEMA (Computer and Business Equipment Manufacturers Association, X3 Secretariat, Suite 500, 311 First St., NW, Washington, DC 20001).

This series of articles will provide an overview of the features of NAPLPS. The specific details and examples presented in these articles are not meant to form a complete NAPLPS specification. Anyone interested in doing development work using NAPLPS should obtain a copy of the ANSI document.

#### Layered Protocols

Modern communication systems are designed in a *layered* or *modular* manner to help prevent extensive system redesign when parts of a system are changed. Layering achieves many of the advantages found in good structured system design. By isolating functions in various layers, we can proceed to standardize and imple-

Text continued on page 210

#### ENHANCE YOUR COLOR COMPUTER WITH THESE GREAT PRODUCTS!

#### MACRO-80c DISK BASED EDITOR/ASSEMBLER

This is a powerful macro assembler, screen oriented editor and machine language monitor. It features local labels, conditional assembly, printer formatting and cross reference listings. Assemble multiple files. Program comes on Radio Shack compatible disk with extensive documentation. Price: \$99.95

#### MICROTEXT COMMUNICATIONS

Make your computer an intelligent printing terminal with off-line storage! Use Microtext for timesharing interactions, printing what is received as it is received and saving text to cassette, and more! Price: \$59.95

#### PI80C PARALLEL PRINTER INTERFACE

Use a parallel printer with your Color Computer! Serial-Parallel converter plugs into the serial port and allows use of Centronics-compatible printers. You supply the printer cable. **Price:** \$69.95

#### THE MICRO WORKS COLOR FORTH

Color Forth is easier to learn than assembly language, executes in less time than Basic and is faster to program in than Basic. Rompack comes with 112-page manual containing glossary of system-specific words, full standard FIG glossary and complete source. A fascinating language designed for the Color Computer! Price: \$109.95

#### SDS-80C SOFTWARE DEVELOPMENT SYSTEM

SDS-80C is a Rompack containing a complete editor, assembler and monitor. It allows the user to write, assemble and debug assembly language programs with no reloading, object patching or other hassles. Supports full 6809 instruction set. **Price:** \$89.95

#### **80C DISASSEMBLER**

Runs on the Color Computer and generates your own source listing of the Basic interpreter ROM. Documentation includes useful ROM entry points, complete memory map, 1/0 hardware details and more. Cassette requires 16K system. **Price:** \$49.95

GAMES: Star Blaster ★ Pac Attack ★ Berserk ★ Cave Hunter ★ Starfire ★ Astro Blast ★ Starship Chameleon ★ Adventure: Black Sanctum ★ Adventure: Calixto Island ★

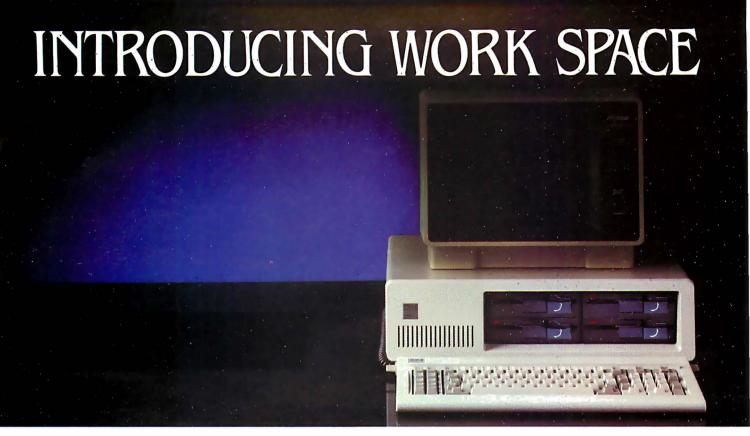


Also Available: Machine Language Monitor □ Books □ Memory Upgrade Kits Parts and Services □ Call or write for more information

California Residents add 6% Tax Master Charge/Visa and COD Accepted

P.O. BOX 1110 DEL MAR, CA 92014

619-942-2400



The new TEAC half height disk drive gives you everything you expect from a top quality disk drive, and one more thing, space. Now you can have up to 3.2 megabytes of floppy storage for the IBM PC without adding an expansion cabinet. Choose four 40 track double sided drives and get 1.2 Mb. Or four 80's for 3.2 Mb. Mix two 40's and two 80's for 2.2 Mb. The TEAC drives operate under PC DOS 1.1 (80 track drives come with JFORMAT, providing electronic disk, print spooling and ten sector formats). Now you can have both increased storage and space. The TEAC double sided 40 track and 80 track drives are priced at just \$299 and \$365 respectively.

### Save on our line of other IBM compatible products.

#### **DRIVES**

- Single and Double sided 40 track drives. Fully supported by PC DOS version 1.1. Drives are easily installed in minutes. Tandon single sided (160K) -\$225, Double sided (320K) - \$299.
- Double sided 80 track (650K) Tandon drive. Available with JFORMAT for PC DOS 1.1 - \$435.
- · 5 megabyte Winchester internal or external disk drive - \$1695.

- RAM Card uses 64K dynamic RAM chips, with parity. 64K card - \$149, additional 64K increments (expandable up to 256K) available for \$79.
- Combo Card. Adds parallel printer, RS 232 async comm and clock calendar

functions. Uses only one slot - \$199. RS 232 Cable - \$24.95. Parallel Printer Cable - \$29.95.

- · Clock Calendar Card. Features seconds, minutes, hours, day of week, date, month and year. Battery backup maintains time and date even when system is turned off - \$99.
- Prom Blaster. Programs most 4K to 64K bit 24 PIN EPROMs. Complete with personality modules and read/write software - \$129.
- · Prototype Card. 3.5 by 8 inch wire-wrap area holds over 85-14 pin dips
- 48K Additional Ram. 27 chips plug easily into master PC board - \$75.

#### HARDWARE

• 64K Byte Hardware Print Spoolers. Internal spooler comes with parallel printer adapter. External version connects easily between computer and printer. Both buffer 32 pages of print output and are user programmable -\$319.

#### SOFTWARE

· Home Finance. Easy to use checkbook

& budget manager - \$34.95.

 Apparat Game Diskette, Includes blackjack, othello, matches and spiralgraph - \$24.95.

#### MONITORS

- · Your choice of high quality and reliable Amdek 12" green or amber screens. Choose the V300 G/A for the color graphics card priced at just \$170, or the V310 G for the monochrome card at just \$199. Both monitors are 18 Mhz BW and are anti-glare.
- Princeton graphics HX-12 RGB color monitor \$695. Other Amdek and NEC monitors also available at big savings. Call for prices.

#### PRINTERS

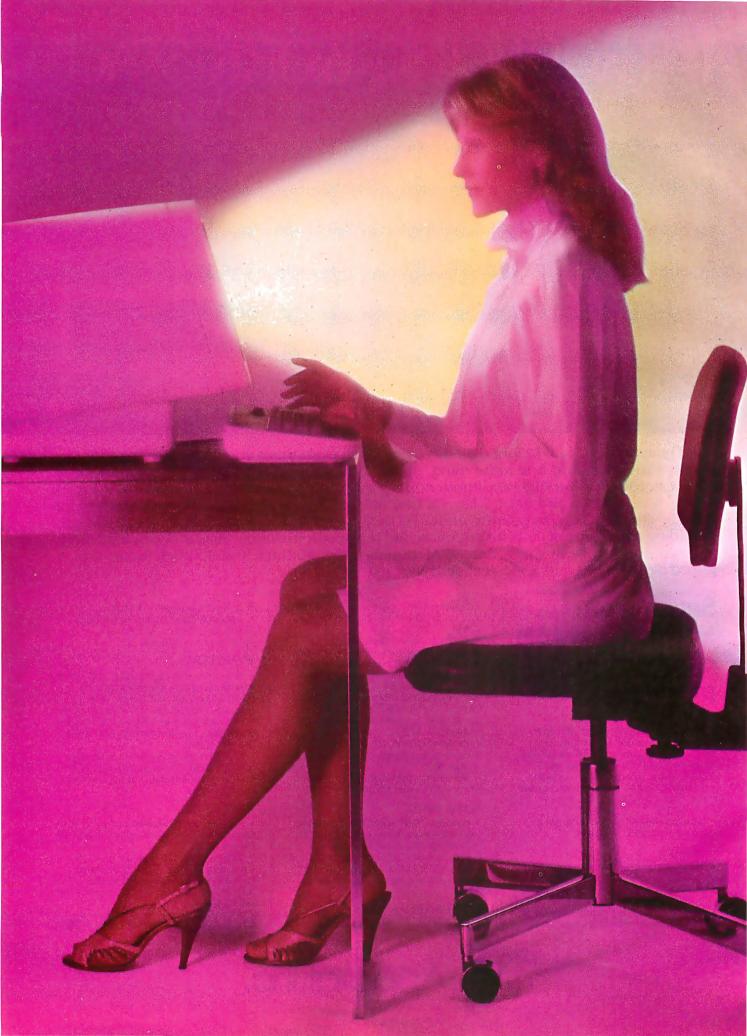
· A variety of the newest Epson, C. Itoh, Okidata and NEC printers available. Call

To order any of the above products, write Apparat, Inc., 4401 S. Tamarac Parkway, Denver, Colorado 80257, 303/741-1778. Or to speed up your order,

800/525-7674.









- REPLACES FLOPPY-DISC DRIVES
- TRANSPARENT TO OPERATING SYSTEM DISC COMMANDS
- \* CP-M™, MP-M™, OASIS™ COMPATIBLE
- NO MOVING PARTS, NO ALIGNMENT, NO MEDIA TO FAIL
- NETWORK READY

Experience DISC-LESS.<sup>TM</sup>
The pleasure is all ours.

A SYNTECH COMPANY

S. D. SYSTEMS, INC 10111 MILLER ROAD DALLAS, TEXAS 75238

(214) 340-0303 TELEX-6829016



#### S-100 Boards from S. C. Digital



#### FLOPPY DISK CONTROLLER

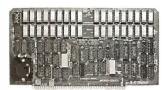
features: Model FDC1

Single or Double density, sides, in any combination of up to four 8" or 5.25" drives.
 Digital phase locked loop.
 DMA data transfer with cross 64K boundaries, 24B address, DMA arbitation.
 Monitor/boot EPROM accomodating two different processors.
 CPM Bios programs.
 Serial port to 19.2K baud.

#### **Z80B CPU BOARD**

features: Model Z80 CPU

● 2, 4 or 6 mhz clock. ● 22 bit Address by Memory Mapping in 16K blocks. ● 2 or 4Kbyte EPROM (not supplied) with Phantom generation. ● Jump on Reset. ● Provision to run two different CPU's on the same bus, such as forth coming 8086.



#### NEW 256K DYNAMIC RAM

features: Model 256KZ

● 8/16B Data, 24B Address. ● Parity bit per Byte ● Transparent refresh ● Unlimited DMA ● 180nsec. Access time ● Will run 8086, 8088, 68000 to 8mhz, Z80, Z8000 to 6mhz without wait states.



#### NEW

#### **64K STATIC RAM**

eatures: Model 64KS

8 8/16B Data 24B Address ● Disable in 2K increments ● 180nsec Access Time (with 64KB) from address on, runs 8086, 68000 to 10mhz, Z80, Z8000 to 8mhz without wait states ● Battery back up capable.

#### 32K STATIC RAM 'Uniselect: 4'

features: Model 32KUSM

8/16 bit data, 16/24 bit address. ● Bank Select by SW selectable port, bit in 32K block. ● Battery backup (battery not supplied) with power-fail detect/automatic Ram disable.
 Complete EPROM (2716) capability with wait states (up to 3), phantom responding or generating.

All boards conform to IEEE696/S100 specifications, fully socketed, screened legends, masks, Gold contacts. Guaranteed One Full Year.

| N            | New Price Effective | February 1, 1983               |
|--------------|---------------------|--------------------------------|
| Model        | Prices              | with                           |
| FDCI         | \$425               | Monitor EPROM                  |
| Z80 CPU      | \$349               | Memory Mapping, 6mhz clock     |
| 256KZ        | \$795               | 256KB, Parity                  |
| 64KS         | \$425               | 64KB, CMOS                     |
| 32KUSM       | \$325               | 32KB, CMOS                     |
| 32KUSM-N     | \$169               | no ram, no power fail          |
| 3SPC         | \$259               | 3 serial, 1 parallel, cassette |
| Z80 monitor  | \$55                | 2K in EPROM, source code       |
| All Boards   | come assembled a    | ind tested.                    |
| Call for cur | rrent and package   | deal prices.                   |

Delivery is within 3 to 5 working days. MC, Visa or COD orders accepted. (Add S6 for COD orders) Illinois residents add 5%% sales tax.

O.E.M. & DEALER PRICING AVAILABLE

S. C. DIGITAL P.O. Box 906

1240 N. Highland Ave., Suite #4 Aurora, Illinois 60507 Phone: (312) 897-7749

| Characteristic                                            | Prestel-like<br>Systems | Telidon-like<br>Systems | Comment                                                                                                                                 |
|-----------------------------------------------------------|-------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Video-display<br>hardware<br>dependence                   | Very much               | Very little             | This is the main advantage of NAPLPS. It is not based on special circuits or architectures.                                             |
| Image<br>complexity                                       | Poor                    | Excellent               | <ul> <li>There is no comparison. It<br/>would be like trying to<br/>compare 8-mm home<br/>movies to 35-mm theater<br/>films.</li> </ul> |
| Easily decoded by terminals                               | Yes                     | No                      | Prestel wins this one. Unfortunately, most things in life that are easy are not worth much.                                             |
| Requires<br>microprocessor<br>terminal                    | No                      | Yes                     | Many thought this was an advantage and an objective worth achieving. Maybe they don't know how to program microprocessors.              |
| Works with printers, plotters, etc.                       | No                      | Yes                     | While some were asking "Why?," others were say- ing "Why not?"                                                                          |
| Memory<br>intensive                                       | No                      | Yes                     | Prestel wins again. Now that<br>16K bits are cheaper than<br>4K, this hardly seems a<br>victory.                                        |
| Preserves 'conceptual' content information                | No                      | Yes                     | Most are still trying to figure out what this means and why it is useful.                                                               |
| Can be extended for years                                 | No                      | Yes                     | This certainly can be disputed. Time will be the judge.                                                                                 |
| Sensitive to<br>errors in the<br>communication<br>channel | Less                    | More                    | A valid point but hardly an issue for a level-6 protocol.                                                                               |
| Cost                                                      | Low                     | ????                    | The true bottom line in some people's books. But how much did a personal computer cost 10 years ago?                                    |

**Table 1:** A comparison of two types of graphics encoding systems for use in videotex applications: Prestel-like systems and Telidon-like systems. NAPLPS is one of the latter.

ment a system for one layer without regard to details of other layers. Because layering is an abstract and sometimes confusing topic, we will use a simple example of communication between two people to illustrate the concept.

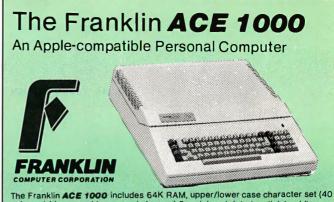
As shown in figure 3 on page 212, when two people converse, their basic goal is to communicate ideas to each other with as much understanding as possible. We shall regard these ideas themselves as the first level or layer of communication. This level, which may be considered the highest

or most abstract, will be called the conceptual level.

In order for people to communicate these ideas, they must choose a language—say, English—as a set of rules for *presenting* the ideas. And with English come all the rules concerning grammar, sentence structure, and so on. We shall include English as part of a second level of communication that we shall call the *logical* level. The ideas from the upper level would have to be expressed in this logical level before a transfer could take place between the two people.



Microline 93 (136 columns)......\$929.88



columns), hi-res graphics, numeric keypad. 8 peripheral slots, joystick/paddle connectors, and a built-in cooling fan. The Franklin ACE 1000 has full hardware/software compatability with all existing Apple II° products.

Our special package price includes The Franklin ACE 1000, one ACE 10 disk

drive with a drive controller card, the PI-49" Amber Monitor, and ACE WRITER, a \$100 word processing program

All for only \$1529.64, UPS delivered.

#### PRINTERS

| Anadex DP-9501A \$1409.88<br>Anadex DP-9620A \$1499.88                                                    |  |
|-----------------------------------------------------------------------------------------------------------|--|
| C. Itoh C. Itoh Prowriter . \$499.88 w/RS-232C. \$609.88 C. Itoh Prowriter 2 \$734.88 w/RS-232C. \$789.88 |  |
| C.Itoh F-10 Starwriter 40 cps<br>Parallel or RS-232C \$1499.88                                            |  |

C.Itoh F-10 Printmaster, 55 Parallel or RS-232C F-10 Tractor

Daisywriter
Daisywriter 2000....
Daisywriter Tractor...
Daisywriter Cable.... Diablo Diablo 630 . . . . . . . Diablo 630 KSR . . . .



DMP-85 Printer \$489.88

Star Micronics



Gemini 10......\$419.88 IDS

IDS Prism 80.
above w/graphics.
above w/sheetfeed.
above w/4-color.
IDS Prism 132.
above w/fraphics \$1104.88 \$1189.88 \$1294.88 \$1839.88 \$1289.88 \$1339.88

#### **PRINTERS**

| IDS Prism      | (cont) |    |
|----------------|--------|----|
| 132 w/sheetfee | d      | 11 |
| above w/4-colo | r      | 11 |

Okidata
Microline 82A
82A Plug-n-Play (PC).
82A Roll Paper Holder
Microline 83A
82A/83A Okigraph ROM
Microline 84 w/graphics & tra
Parallel, 200 cps.
RS-232C, 200 cps. \$429.88 \$39.88 \$59.88 \$49.88 \$889.88 \$44.88

NEC 3510 ... NEC 3530 ... NEC 3550 ... 3500 Tractor



NEC PC-8023A \$509.88

Qume Qume Sprint 9/45 ...... \$2109.88

Smith-Corona .. \$599.88

Smith Corona TP-1 ....... \$
Specify either 10 or 12 cpi,
& parallel or RS-23 2C interface

CALL FOR PRICES on Cannon, Centronics, Datasouth, Epson, Mannesmann Tally, Panasonic, Ricoh, Silver Reed, & others

#### MONITORS



USI Pi-3 (12" amber)....... USI Pi-4 (9" amber)......

Amdek 310G (12" green) .... Amdek 310A (12" amber) .... Amdek Color II (Hi-resRGB) .... Amdek Color III (RGB) ....

Electrohome 1 (RGB) ...... Electrohome 2 (Hi-res RGB) ... PC Cable ....

#### MODEMS

DC Hayes
Hayes 300 Baud
Hayes 1200 Baud
Hayes Micromodem II
above. w/software

Novation
Novation 103 SmartCat.
Novation 103/212 SmartCat.
Novation Apple Cat 300
Novation 300-1200 Kit
Novation Apple Cat 1200
Novation Cat
Novation D-Cat
Novation J-Cat \$224.88 \$509.88 \$334.88 \$324.88 \$579.88 \$159.88 \$189.88 \$139.88 Multi-Line Junction Box..... \$39.88

**Information & Orders** (603)-881-9855 Orders Only: (800)-343-0726

#### No Hidden Charges

#### **APPLE HARDWARE**

**PKASO Smart Interfaces** 

Parallel Card w/cable ..... \$89.88

 Corona Data Systems

 5mB Hard Disk
 \$2049.88

 10mB Hard Disk
 \$2459.88

MicroSoft

**Mountain Computer** \$2364.88 \$2829.88 \$1359.88 \$1359.88 \$159.88 \$159.88 \$179.88 5mB Hard Disk.... 10mB Hard Disk ... Card Reader
CPS MultiFunction
A/D—D/A Convertor
RAMplus + 16K
RAMplus + 32K
ROMplus +
ROMwriter Card
SuperTalker

Orange Micro \$149.88

 
 Practical Peripherals

 16K Microbuffer II
 \$219.88

 32K Microbuffer II
 \$249.88
 Rana Systems

Elite 1 Disk Drive
Elite 2 Disk Drive
Elite 3 Disk Drive
Disk Controller

Saturn Systems 32K RAM Board 64K RAM Board 128K RAM Board

SSM AIO Multi-Function Card..... VideoTerm.... VideTerm Combo.....

Enhancer II..... Vista A-800 Disk Controller

FREE UPS shipping on all orders—No extra charge to use credit cards—All equipment shipped factory fresh with manufacturer's warranty—COD orders accepted (\$10 fee added)—No purchase orders accepted—No foreign or APO orders accepted—Minimum \$50 per order—This ad prepared in December: prices are subject to change.

HIGH TECHNOLOGY AT AFFORDABLE PRICES

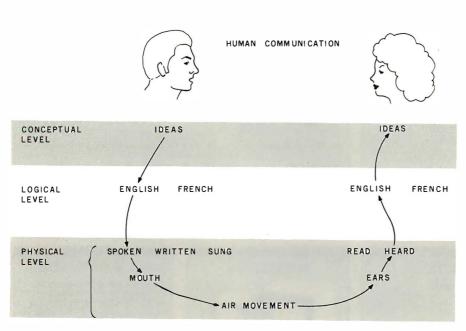
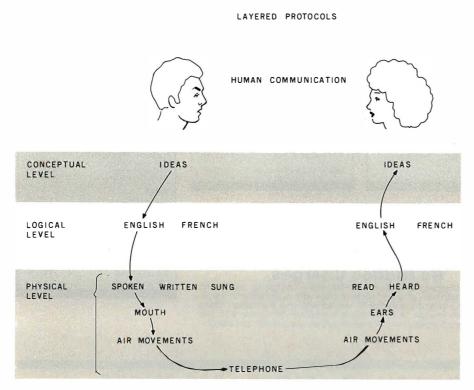


Figure 3: A diagram showing how communication can be divided into a series of layered protocols. Here, the example of communication is a simple conversation in English between two people. The conceptual level comprises the actual ideas to be communicated. The logical level comprises the language in which the ideas are to be expressed. The physical level comprises the physical phenomena that are used to convey the English words. In the case of speech, this involves movements of the mouth, air, and the listener's eardrums.



**Figure 4:** If the conversation in figure 3 were conducted over a telephone, we could interpret this as a change of the physical layer. The advantage of layered protocols is that one layer can be changed without affecting the other layers. Although the physical level here has been changed, the logical level—English—is unaffected.

Once English is chosen, a mechanism is needed to physically transfer the logical representations of the conceptual ideas from one person to another. This will be done on the physical level. In human communication, several choices exist. The most obvious is speech. When we speak, a set of physical tools is used. The English constructs from the logical level are converted to movements of the diaphragm, tongue, and mouth, which result in the movement of air. The vibrating air is detected by the other person's ears (if she is listening) and is transferred into bone and muscle movements. The second person must decode these movements, recreate the English, and conceptualize the idea.

This example can also be used to illustrate why layering is useful in preventing complete system redesign when changes are made. It can even be used to show how standard layers can be mixed and matched as the needs of a system change.

Suppose that the two people are separated by a large distance and that a telephone must be used so that they can talk to one another. The lowest level (the physical level) is the only area affected. As shown in figure 4, the telephone and the telephone network are used to transport the sounds from one location to another. The logical English constructs can remain the same and the ideas can be communicated.

If French or German is substituted at the logic level, no changes need to be made to the physical level. The conceptual level may or may not be affected, depending on how adept the languages are in representing certain ideas. For example, when learning a second language, one usually runs into the case where an instructor says, "That idea really can't be translated into this language."

As mentioned before, layering is done to prevent expensive system redesign when parts of a complex communication system are changed. Imagine how inconvenient it would have been if everyone had had to learn a new language when the telephone was invented. Or imagine how expensive it would be if a dif-



# GREAT NEWS FOR EVERYONE WITH A PERSONAL COMPUTER! A NEW BREED OF PRINTER, PURRRFECTLY PRICED.

160 CPS Advanced, Multifunction Printing For Under \$700.

When advertising, TV and film people need a puma to pose or a lion on location, they call the Dawn Animal Agency. Daily, Dawn sends their exotic animals from coast to coast. And they generate a jungle of data in the process. Like so many growing businesses, they need to mate a personal computer to a printer that will keep pace with business demands. But won't take a huge bite from the budget.

Okidata's new multifuction Microline (ML) 92 printer is just the animal. It prints high resolution, correspondence quality text that's a match for any daisywheel's at 40 cps. Graphics and emphasized and enhanced printing at 80 cps. And bidirectional, data processing with short line seeking logic at 160 cps. Add an alternate, downline loadable character set, and you've got one heck of a printer. And there's an ML 93, too, that adds wide-column printing to the picture.

Both of our new high performers have no duty cycle limitations and feature the Okidata, 9-pin print head that's guaranteed for one full year. But the really great news about each is price: \$699 suggested retail for the ML 92; \$1249 for its big brother. Absolutely purrrfect.

For more great news about the ML 92, 93 and all the Okidata printers, see your computer dealer or call 1-800-OKIDATA. In NJ, 609-235-2600. Okidata, Mt. Laurel, NJ 08054



A subsidiary of Oki Electric Industry Company Ltd.

All Okidata printers are compatible with Apple, IBM, Radio Shack, Osborne and just about every other personal computer.

ferent telephone system were needed to speak different foreign languages.

Data-communication systems have likewise been divided into various lavers. A seven-level model promoted by the International Organization for Standardization (ISO) is typically used. A complete description of the model is beyond the scope of this article. In general terms, however, this seven-layer model, like our simple example, runs from the more abstract layers at the top (level 7) to the physical layers at the bottom (level 1). Most of the work in standardizing data-communication protocols has heretofore been done at the lower. physical levels.

NAPLPS is a standard for the sixth level, commonly called the presentation level, of the seven-level model. In our example of human communication, NAPLPS is similar to the logical (English, French, and German) level. NAPLPS has been designed to allow a large variety of information to be encoded in a manner that preserves the conceptual content of the information, NAPLPS codes can be physically transported between computer systems via modems and data links, floppy disks, magnetic tapes. and other common mechanisms.

#### **Code-Extension Techniques**

The coding of NAPLPS begins with bits and bytes. The 8-bit byte can be used to represent 256 unique patterns or code points. At first glance, the 256 codes might seem to be a large

In NAPLPS, 96-code sets can be swapped in and out of a large 256-code table.

enough set, especially if only letters, digits, and control information must be encoded. But in order to encode graphics coordinates, colors, graphics drawing commands, and advanced control information, more than 256 codes are needed. The obvious solution is to group bytes together sequentially to form an extremely large set of commands. This is similar to what occurs in English where the 26 letters of the alphabet are grouped to form words.

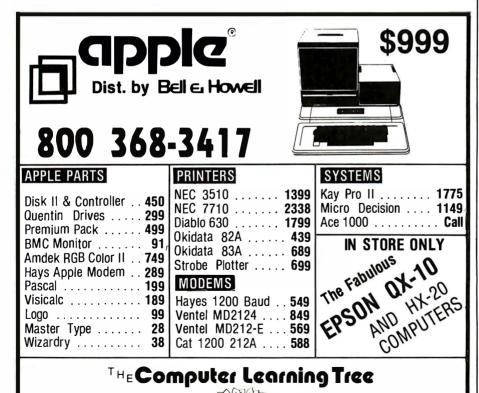
Grouping of bytes is commonly called code extension. Many codeextension techniques use the ASCII Escape character (ESC, hexadecimal 1B. decimal 27) as an indicator that the next character has a special meaning. Many times, the next character indicates that more characters follow. (An example of this type of code extension is the typical multicharacter Escape sequence for the cursor-positioning sequence supported by many terminals.)

This approach to code extension is fine for a small number of extensions. but tends to become a hodgepodge of inconsistent code sequences when a large number of extensions are defined

NAPLPS has been designed with an extremely general code-extension structure that is independent of the specific "meanings" of the codes, and is based on an ISO recommendation (ISO 2022.2).

Keep in mind that up to this point we have been talking about codes as 8-bit binary numbers in the decimal range 0 to 255. No meaning has been placed on the codes. Because of the widespread use of ASCII, many people assume that a capital "C" must always be coded as a decimal 67, as it is in ASCII. The assumption is also made that the value 67 cannot be used to code anything but capital Cs. In order to fully understand NAPLPS. you must first realize that the relationship that exists between the capital C and 67 is by convention and not due to some physical limitation of computers or an act of God. Furthermore, you must realize that the decimal value 67 (or any code) can be given other meanings in other contexts as long as an indication is given as to which context is currently in effect.

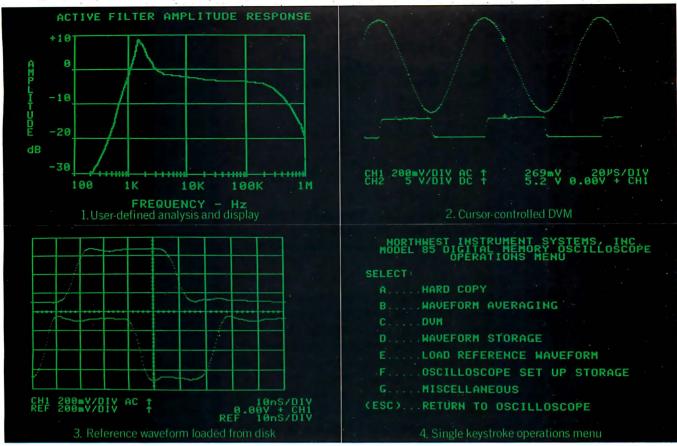
The basic strategy underlying code extension in NAPLPS is to take a large table of codes (128 or 256) and divide it into smaller sets of codes that can be "swapped" in and out of the large table. The small code sets



**Government Sales** 

Call 703-750-2632

7023 Little River Tnpk. Annandale, VA 22003



#### WHICH OF THESE DISPLAYS WERE GENERATED BY A PERSONAL COMPUTER?

Every single one of them. And not just generated, either. The instrument settings were configured, signals acquired, and analysis performed via a personal computer. also. An Apple II® to be specific. Equipped with Disk II® 48K memory, DOS 3.3 and a remarkable, make that revolutionary, engineering breakthrough known as the Model 85 aScope<sup>™</sup>. Remarkable because aScope transforms any computer in the Apple II series into a dual channel, DC to 50 MHz repetitive signal bandwidth (25 KHz real time sampling rate), fully programmable, digital memory oscilloscope. Revolutionary because it does all this for less than \$1,000.

The way we achieved this cost reduction was by not following the path of conventional instrument architecture, combining a stand-alone programmable oscilloscope with a general purpose computer controller. Instead, we integrated. Making aScope a peripheral. Supplying only what was needed to make the personal computer a high performance instrument.

Result? An oscilloscope system that allows you to configure a setup, define the analysis you desire and produce an end result display in the most useful format. Many frequently

performed routines are already part of aScope's software. But more importantly, the system's architecture is designed to accommodate considerable user modification via coresident BASIC or assembly language programs. (One example: the user-defined program to plot the amplitude response of an active filter shown in display 1 above.)

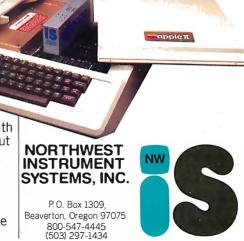
aScope will average waveforms. Store waveforms on disk in binary or text files. Store instrument settings for automated setup. Or load and display a reference waveform from disk (display 3 above).

a Scope also delivers waveform voltage readings utilizing a cursor-controlled digital voltmeter (display 2). And generates hard copy via an Epson MX-80™ or Silentype® printer.

Space permitting, we'd go on about a Scope's menu driven single keystroke commands (display 4), its sub-menus with complete prompting and so forth. But frankly, we suspect you're probably as intrigued as you could be on the basis of one ad.

So here's how to find out more. Call 800-547-4445. This will provide you with the name of the aScope representative or authorized computer dealer in your area, as well as an opportunity to invest \$10 in our comprehensive aScope demonstration disk.

The Model 85 aScope. We admit, the performance it delivers for the price is so remarkable, it may initially strike you as unbelievable. But then, when you think about all the breakthrough products this industry has seen over the last decade, sounding unbelievable at first is almost a tradition.



Apple II®, Disk II®, and Silentype® are registered trademarks of Apple Computers, Inc. Epson MX-80™is a trademark of Epson America, Inc.

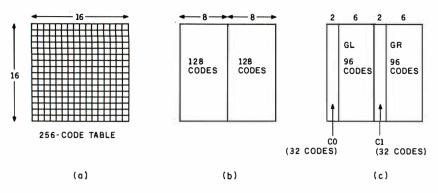


Figure 5: With an 8-bit code, 256 combinations are possible. These can be represented on a 16 by 16 table (a). For convenience, this large table can be divided into two 128-code tables (b). Each of these 128-code tables can then be further subdivided into a 32-code table and a 96-code table (c).

can include codes with similar characteristics. The sets can have standard names, and a standard mechanism can be established to control the swapping. New sets can be added as long as a unique name is chosen. Because a standard mechanism would already be in place to handle the swapping, the new code set could be added without affecting other sets.

Up to now, we have been talking

mainly about an 8-bit code. Actually, two code-extension techniques are supported in NAPLPS: 7-bit and 8-bit. The 7-bit extension technique is used in systems where only 7 data bits can be passed through the lower, physical levels of communication (levels 1 through 5). The eighth bit is often reserved for parity so that errors can be detected. In a seven-level system, error control is usually performed at level 2. Because NAPLPS is a level-6 protocol, the error-control bits have already been handled prior to the data's reaching level 6.

The 8-bit code-extension technique is used when all 8 data bits are available for NAPLPS information. This is the method that is used in systems where the low-level protocols can support 8 bits. It will also be used when files containing NAPLPS are exchanged between users via disks and tapes. Because of the eventual widespread use of the 8-bit codeextension technique, it is the one that will be described in this article.

With 8 data bits, the 256 codes or patterns can be grouped in the form of a table with 16 rows and 16 columns (16  $\times$  16 = 256), as shown in figure 5a.

The 16 by 16 table can be divided into two sets of 128 codes, as shown in figure 5b. These two sets can each be partitioned into sets of 32 and 96 codes (32 + 96 = 128), as shown in figure 5c. The 32 codes will occupy two columns of the original 16 by 16



Introductory Price \$1095.

plus tax and shipping





SEND FOR FREE **BROCHURE** 

to 1 megabyte. Independent regulated power supply.

Automatic power failure detect and battery backup.

Standard 256K bytes of storage expandable

- Hardware error detection and write protect. Only 4 bytes-ports of address I/O space used
- Hardware optimized for block transfers and access.
- Identify your model. Drivers, diagnostics, and utilities software provided.

#### PION, INC. Tel. (617)648-1717 74 Appleton St., Arlington, MA 02174

\*\*Trade Mark Tandy Corp. \*Trade Mark Apple

#### a message to our subscribers

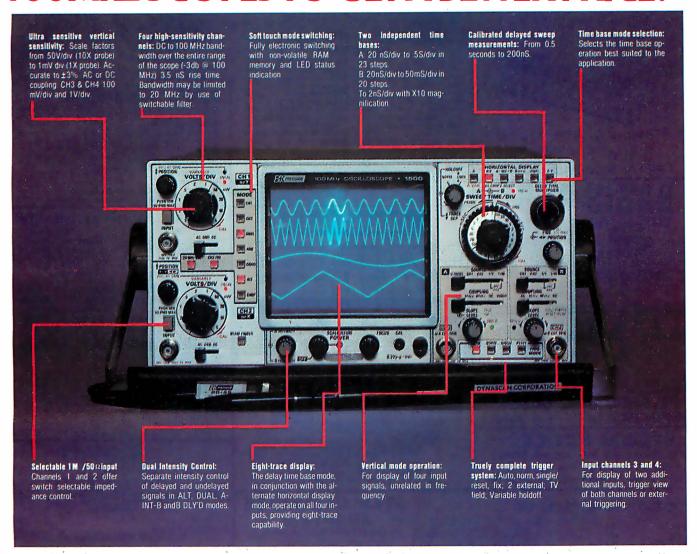
From time to time we make the BYTE subscriber list available to other companies who wish to send our subscribers promotional material about their products. We take great care to screen these companies, choosing only those who are reputable, and whose products, services or information we feel would be of interest to you. Direct mail is an efficient medium for presenting the latest personal computer goods and services to our subscribers.

Many BYTE subscribers appreciate this controlled use of our mailing list, and look forward to finding information of interest to them in the mail. Used are our subscribers' names and addresses only (no other information we may have is ever given).

While we believe the distribution of this information is of benefit to our subscribers, we firmly respect the wishes of any subscriber who does not want to receive such promotional literature. Should you wish to restrict the use of your name, simply send your request to the following address.

BYTE Publications Inc. Attn: Circulation Department 70 Main St Peterborough NH 03458

#### THE AIR FORCE HAD TO BUY 8,000 100MHz SCOPES TO GET A BETTER PRICE!



You don't have to be Uncle Sam to get a great scope for a great price! The Air Force will pay \$1,359.00 each for their general purpose, 100 MHz oscilloscopes, at the contractual rate of 275 units per month over 18 months with options for 3,000 more. This B&K Precision 1500 is not just another general purpose scope, but a dual-time base, quad-channel, eight-trace, ultra-high performance 100 MHz scope at only \$1495.00 each - period!

What truly separates the 1500 from the rest of the pack is it's unique ability to display four digital signals and not related in frequency simultaneously. If desired, a delayed portion of each waveform can be displayed providing eight traces.

Another key feature of the 1500 is dual time base operation. This feature allows for independent operation of the A Sweep and B Sweep circuits. In this mode of operation, the A Sweep is operated by A Trigger Section and the B Sweep is operated by the B Trigger Section. Dual time base operation allows the 1500 to act like two 100MHz oscilloscopes and to display signals unrelated in time with their own independent trigger

The 1500 offers all the capabilities you might demand from a lab grade oscilloscope. Capabilities such as the increasingly popular feature of trigger view is not only provided on the A Channel but the B Channel as well. Other features include selectable 1 M $\Omega$  or 50  $\Omega$  inputs which prevent high frequency impedance mismatches that can cause serious measurement errors. When working with low frequencies, the 20 MHz bandwidth filter eliminates high frequency noise. Function switching on the 1500 is performed by touch sensitive lighted pushbuttons with electronic switching logic with non volatile RAM. This unique design increases user convenience and reliability by eliminating a significant

amount of mechanical switching and cabling.

The 1500 employs a high efficency switching power supply to deliver cool regulated power for long trouble-free performance, at the lowest weight - only 16.5 lbs. for the entire

Other refinements include a 6" diag. 8 x 10 cm illuminated graticule high-brightness domed mesh 16 KV rectangular CRT, beam finder button, LED UNCAL indicators, single sweep operation, variable holdoff as well as alternate or chop operation with two selectable chop frequencies. Probe calibrator for both current and voltage probes. CH1 and CH2 gating pulses are provided for interfacing with external equipment. Also provided is a CH1 50 \( \Omega\) output for driving an external counter preventing the need for an external "T" adapter and the associated impedance mismatch problems it causes. The output may also be cascaded into CH2 providing 500 uV sensitivity at 100MHz.

B&K Precision backs the 1500 with a one year warranty and

The cost? Remarkably reasonable, especially when you compare it to the other leading 60MHz or 100MHz Dual Trace oscilloscopes. This price breakthrough is made possible by **PRIORITY ONE ELECTRONICS** unequalled buying power. As the largest distributor of high performance oscilloscopes, we were able to place the largest order for scopes in B&K's history. We were able to obtain special pricing that allows us to pass on to you a

\$755.00 savings, while the supply lasts.

(Supplied with 2 X10 Probes)
ORDER TOLL FREE: (800) 423-5922 CA. AK. HI. CALL: (213) 709-5111

has nation wide service available.

OR CLIP AND MAIL THE ATTACHED COUPON Circle 341 on inquiry card.

| YES! I WANT TO TAKE AD  Enclosed is my □ Personal check or Money orde □ Charge my VISA or Master Card — Number: | er                            | GE OF TI | HIS SUPER C               | OSCILLOSCOPE VA  |               |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------|----------|---------------------------|------------------|---------------|
| Quantity Model  BNBKP1500 100MHz Oscilloscope BNPLC100 Snap-on front panel cover                                | Price<br>\$1495.00<br>\$26.00 | TOTAL    | NAME                      | (On Credit Card) |               |
| BNPLC150 Vinyl case for probes Shipping & Handling: \$15.00 (for each Calif. residents add 6½% Sales T          | \$32.00<br>scope)             |          | STREET CITY TELEPHONE NO. |                  | ZIP           |
| PRIORITY ELECTR                                                                                                 | ONICS                         | . 9161   |                           |                  | CA 91311 5887 |

# OMPULER



# FRANKLIN ACE 1000

We Have An Ace Up Our Sleeve For You! Call For Sale Price Now!

# THE ALTERNATIVE

Runs Apple® Software and CP/M®!

- 6502 and Z-80 Microprocessors RGB and Composite Video Output Selectable 40 or 80 Column Display
- Six Apple Compatable Expansion Slots On Sale Now!

CALL FOR CATALOG



PC 8800 & PC 6000 **New For '83** . . . . . . . . . . . . . . . . . . € ALL!

VVVV PPI GOOD

99

.319

... 59\*

6 Slot Expand......

40/80 Col w/64K ...

Audio/Video Cable.

Wico Trackball . .

40/80 Col. w/16K . . . . 229

Wico Joystick Delux 37★

Afron Chassis.

#### SPECIAL NOTICE!

Our buyers were at the Comdex Show at the time this ad was due .... Call us for new product announcements!

....469

Disk Drive.

Modem + Centronics Cable

Programmers Aid Cart 44 VicMon 43 Pro. Ref. Guide 14

Slot Expander.....

Super Expander.

#### SYSCOM SYSTEMS



Compatable System - \$799.00

ACCESSORIES THE

| Fourth Drive                    | Hayes 1200 Baud 539<br>Scoper Spooler (16K) 299<br>Z-80 by Microsoft 229<br>Videoterm (80 col.) 244 |
|---------------------------------|-----------------------------------------------------------------------------------------------------|
| Micro Sci A-2 349               | EP8 Keyboard319                                                                                     |
| Micro Sci A-40 349              | The Grappier Plus 119                                                                               |
| Trackball By T.G49              | RGB by Electrohome 219                                                                              |
| 3" Drives by Amdek 749          | Parallel Card (6' cable) 69                                                                         |
| New Vista ProductsCall!         | Z-Card by ALS 139                                                                                   |
| Versa Card169                   | The CP/M Card ByAL8329                                                                              |
| 16K Ram (2yr WNTY) 59           | Synergizer By ALS529                                                                                |
| Boftcard Plus By MS489          | Joystick by TG 46                                                                                   |
| AIO II                          | In Line Buffer 229                                                                                  |
| J-Cat By Nov124                 | Disk Emulator (294K) 689                                                                            |
| CPS Multi-Func by Mtn 169       | Appli-Card 6MZ 429                                                                                  |
| Micro Modem II <sup>®</sup> 278 | Expan Chassis by Mtn 539<br>Winchester Hard DiskCALL                                                |
| Smart Modem 219                 | TERED TRADEMARK                                                                                     |
|                                 |                                                                                                     |



| SOFTWARE                        |     |
|---------------------------------|-----|
| Screen Writer II 103            |     |
| Magic Window 69                 |     |
| SuperText II by Muse 118        |     |
| BPI SOFTWARECALL                |     |
| Exec Secretary by S. S. 189     |     |
| Pro. Easy Writer by IUS129      |     |
| LetterPRFTw/mailmerge109        |     |
| WORD HANDLER 147                |     |
| General Manager 109             |     |
| Visicalc by Visicorp 183        |     |
| PFS by Soft Pub. Corp 69        |     |
| Visifile by Visicorp 184        |     |
| Visitrd/VisipItbyVisicorp196    |     |
| PES: Report 69                  | ļ   |
| DB Master 164                   |     |
| PFS: Report 69<br>DB Master 164 | 900 |

|      | CP/M®* SOFTWARE             |
|------|-----------------------------|
|      | Basic Interpreter M. CALL   |
| 7    | Basic Compiler by MS289     |
| 1    | Cobol-80 by Microsoft.539   |
| 27.  | Fortran-80 by Microsoft1 46 |
|      | Word Star319                |
| )3   | Mail Merge159               |
| 9    | Spell Star                  |
| 8    | Data Star                   |
| L 19 | Supercalc212                |
| ě    | d Base II by Ashton-tate494 |
| 9    | G/L by Peachtree CALL       |
| 7    | A/R by PeachtreeCALL        |
| 19   | PeachcalcCALL               |
| 13   | Tax Preparer '82 109        |
| 9    | Real Estate Analyzer 139    |
| 6    | Bag of Tricks 29            |
| 9    | Zoom Graphix 27             |
| 4    | Special Effects 27          |
|      |                             |

**CALL FOR CATALOG!** \*CP/M is a Registered Trademark

#### **COLUMBIA**

The Columbia MPC is IBM® P/C Hardware & Software Compatable. The Price? Non - Comparable! Save Hundreds and Call

#### FREE\* SHIPPING

#### EKAYCOMP II

The totally portable, powerful and profitable computer for your home or office.

▼Z-80 ● 64K Ram ● two 5¼" floppy-disc drives (double density) ● 9" video display (80 col.)
 ■ RS-232C ● Parallel Printer ● Interface

#### SOFTWARE INCLUDED!

#### By Non-Linear Systems

- CP/M<sup>®</sup> 2.2 S/Basic Profit Plan Perfect Writer W/P Perfect Calc. Perfect Filer Perfect Speller

#### ATARI CARTRIDGE All New 64 & Vic Catalog .. Free! ADAPTER! Use Cartridges For Atari

400/800 On Your Vic On Sale \$79.00

#### APPLE LOADER!

| FOR C-64     | \$89.00          | Eag  |
|--------------|------------------|------|
| CARTRIDGES   | TAPES            | Eag  |
| Choplifter34 | Hesplot17        | Eag  |
| Trashman     | Totl Text 1.5 28 | File |
| Hesmon       | Totl Lable 1.017 | New  |
| Vic Fourth49 | Munchieman10     |      |
| TERMINALS    | MONIT            | ORS  |

#### M.IBM.IBM.IBM.IBM.IBM. AST QUADRAM

| Combo Plus 64K 439<br>Combo Plus 128K 599<br>Combo Plus 192K 769<br>Combo Plus 256K 939<br>QUALITY COMP. | Quadboard II 64K 459<br>Quadboard II 256K 739<br>Quad 512+64K 399<br>Quad 512+512 K 1099<br>Quadscreen 1499                                                                                                               |
|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Big Blue 499                                                                                             | Quadcolor I 299<br>Quadcolor III 719                                                                                                                                                                                      |
| DAVONG                                                                                                   |                                                                                                                                                                                                                           |
| 5 Meg Hard Disk 1569<br>64K Mem. Expan 269<br>192K Mem. Expan 499<br>256K Mem. Expan 599                 | Baby Blue CP/M 489<br>Baby Blue Ram Plus 679                                                                                                                                                                              |
|                                                                                                          | WARE                                                                                                                                                                                                                      |
| Visicalc (256K)                                                                                          | Vedit-86 by Cmpview 199 The Programmer. 369 CP/M-86 by Digital. 279 Basic-80 by MSoft. 297 Fortran-80 by MSoft 19 M/Sort by MSoft . 159 Easy by Denver. 543 Mathemagic by ISM 69 Logon by Ferox. 129 Fastscreen by Cu. 73 |

| ANTER                                                                            |               |
|----------------------------------------------------------------------------------|---------------|
| Z-89-81 (48K • 1.5.100K Drive)                                                   | 2195          |
| Z-100 All In One (Z-120-22)<br>Z-100 Low Profile (Z-110-22)<br>Call For Brochure | SALE!<br>CALL |

CALL FOR CATALOGI

#### eeks le The Price/Performance Leader! Eagle II. Eagle III .. 3199 Eagle IV 4699 File 10. New! Eagle 1600 (8086 Microprocessor) Call! Free Brochure

#### 800 48K 569 400 16 K..... CALL New Atari Products For '83! 410 Recorder 74 810 Disk Drive 1110 439 825 Printer 639 830 Modem 71 pps 459 The Bookkeeper The Entertainer The Educator The Educator The Programmer The Communicator PacMan Mosskaltack Chopiliter Frogger Goff. Microsoft Basic 830 Modem. 28 850 Interface Full-View 80 Joystick (Pair) 48K by Intek 32K by Microtek 16K by Microtek Epson Cable .. 69 .. 34 CALL FOR CATALOGI

TO ORDER: Phone orders invited using Visa, Mastercard, American Express, or bank wire transfers. Visa, MC, and American Express service charge of 2%. Mail orders may send charge card number (include expiration date), cashiers check, money order, or personal check (allow 10 business days for personal or company checks to clear). Please add 3% (\$5.00 minimum) for UPS shipping, handling, and insurance. COD's minimum \$250.00 with \$25.00 deposit. All equipment is in factory cartons with manufacturer warranty. Opened products not returnable. Restocking

#### TELEVIDEO TVI 910

TVI 910 Plus TVI 912

ADDS Viewpoint A-1 Viewpoint A-2... Viewpoint /60 .. 749

NEC 578 JB 1260 12" Green .... 589 JB 1201 12" Color .... 719 12" RG B (Hi-Res) .....

**AMDEK** 

Video 300..... 

309

Microline 82A. Microline 84 (Parallel). C. ITOH F-10 Printmaster (Par) ...... 1789

OKIDATA

Microline 80 (Parallel). . . . . . . 314

.1019

CALL FOR COMPLETE CATALOG

789

fee for returned merchandise. Equipment subject to price change and availability. Retail prices differ from mail order prices. WE SHIP THE SAME DAY ON MOST ORDERS! \$40.00 min. purchase. \*With prepaid cash orders \*Exclude certain printers & monitors & foreign orders

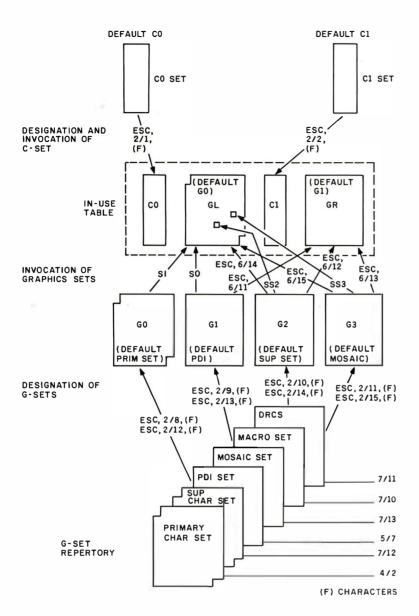
Calif. residents add 6% State Tax. For APO and FPO – add 10% (\$25.00 min. torpostage, Calif. residents add 6% Sales Tax). Include phone number, credit cards not accepted. Foreign Orders – include 3% handling, shipped air freight

collect credit cards not accepted.

Circle 111 on inquiry card

VISA"

COMPUTER SPECIALTIES (619) 579-0330 MAIL TO: 1251 BROADWAY **EL CAJON, CA. 92021** 



**Figure 6:** A diagram showing the NAPLPS code-extension technique in an 8-bit environment. By swapping various 96-character graphics sets into and out of the graphics areas of the "in use" table, we can access a large number of characters or commands. Four graphics sets (or G-sets) are selected from the G-set repertory and placed in designated sets (G0 through G3). Then, two of these designated sets are placed in the graphics areas (GR and GL) of the 256-code "in use" table. Various code sequences (e.g., ESC 6/14) or control codes (e.g., SI) are used to swap the G-sets. The notation "6/14" represents the number 6E in hexadecimal. "(F)" refers to a single-code name of a particular G-set.

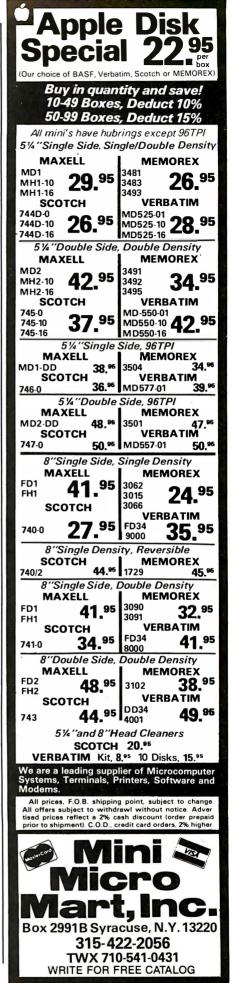
table; the 96-code set will require six columns.

As you can see, the large 256-character table has now been divided into four smaller regions. These regions (or sets) allow us to group codes of similar use into tables of manageable size. The two small tables are called control sets or C-sets; the two large tables, graphics sets or G-sets.

As we mentioned before, a mechanism has been designed to allow a

variety of code sets to be swapped into and out of these four areas of the large table. Currently, however, code-set swapping is done only with the large 96-character G-sets. Although a mechanism exists for swapping the small areas (C-sets), it is not being used at this time.

Before a G-set is swapped into one of the large areas, it must be selected from a repertory and placed into one of four designated sets. Two of these



designated sets are then placed into GL and GR, the two large areas in figure 5c. Codes are then interpreted based on the current G-sets that are in use in the large table.

Figure 6 illustrates this mechanism for the 8-bit code-extension technique. The arrows and labels indicate special code sequences that are used to cause the swapping. Most of these code sequences begin with the Escape character. The notation "6/14" used in figure 6 is an alternate way of specifying a code with a specific bit pattern. On a 16 by 16 table, 6/14 represents the bit pattern that refers to column 6 and row 14 of the table. In hexadecimal, 6/14 would be 6E; in decimal,  $(6 \times 16) + 14 = 110$ .

To move a G-set from the repertory to one of the designated sets, a three-character sequence is used. The third character in the sequence (represented by "(F)" in figure 6) is the "name" of the G-set. Each G-set has a unique name that is specified in the NAPLPS standard. For example, the name of the ASCII G-set is 4/2 (42 in hexadecimal). To move the ASCII G-set from the repertory to the G0 designated set, you would use the following sequence: ESC, 2/8, 4/2. New G-sets can be added at a later date by specifying a new name that has not been used.

If figure 6 looks confusing, the following analogy may help. Imagine that figure 6 illustrates a complex jukebox that has a number of albums

#### The Primary Character Set contains 96 "oldies but goodies"...

(G-sets) stored in a rack (repertory) and four turntables (designated sets G0, G1, G2, and G3). Buttons are available (e.g., the sequence ESC, 2/8, (F)) that allow you to specify which album should be placed on which turntable. Furthermore, this jukebox has two sound systems (GL and GR). And more buttons

(SO-Shift Out, SI-Shift In, ESC 6/14, etc.) are provided that allow turntables to be connected to one (or both) of the sound systems.

As we continue our analogy, imagine that each album has exactly 96 songs, and that the turntable can very quickly locate and play any of these songs. Furthermore, both sound systems have 96 buttons that can be used to select and play any of the songs instantly.

It should be noted that in order to lessen the amount of record changing involved, four turntables are provided. With two sound systems, we can have two albums or 192 (96  $\times$  2) songs available instantly. Also, we can have another 192 songs available simply by switching the correct turntable to a sound system. We can play an almost unlimited number of songs if we are willing to go to the trouble of selecting an album, placing it on one of the turntables, switching the turntable to one of the sound systems, and finally selecting a song.

At this point, you are probably wondering what this has to do with text, graphics, NAPLPS, and the price of tea in China. You are also probably wondering what albums are available in the repertory.

NAPLPS currently has six selections available in the repertory (this record industry is still in its infancy). The Primary Character Set, also known as ASCII, is full of 96 oldies but goodies like 0, 1, 2, . . . A, B, C, and x, y, z, etc. The Supplementary Character Set is full of 96 new and old international favorites, most of which are rarely played in the U.S. These include  $\alpha$  and  $\beta$ . The Picture-Description Instructions album (PDIs) contains selections like "Line." "Arc," and "Draw Me a Polygon." Some of the hottest hits going are on this album. The Mosaics album is full of some very old songs that all sound the same. It is seldom played except by people over 40. The Macro album contains songs that cause other songs to be played. (You get a lot for your quarter here.) The Dynamically Redefinable Character Set album (DRCS) is initially blank. It can be used to mix existing songs together to form new songs. (Yes, on this juke-

#### **Need to Measure Your Corporate Communications?**

Want to define your company's image? Measure competitive strengths? Determine the acceptance of your company publications? Gauge reactions to your annual report? Determine the effectiveness of your corporate advertising? Monitor the impact of important trends and developments on your company's business?

#### Call McGraw-Hill Research

Backed by 30 years of research experience covering scores of markets and fields, McGraw-Hill Research professionals design custom projects that can make a big difference in the success of your corporate communications efforts. The Corporate Communications Research Center will meet your research needs promptly, at a reasonable price.

Put McGraw-Hill Research to work for you.

For a quote or proposal, call Joan Bullen, Director-Corporate Communications Research Center at (212) 997-3517 or Eleanor Nicoletti, Project Director, at (212) 997-3095. Or, write Corporate Communications Research Center, 1221 Avenue of the Americas, New York, NY 10020



If it's a communications problem, we probably pioneered the solution.



**C-103 DESKTOP COMPUTER.** Available with LSI 11/23 or LSI 11/2. Complete computer system enclosed within a VT-103 video terminal, immediate delivery. Only **\$2,995.00** with LSI 11/2 and 64K Memory. **\$4,595.00** with LSI 11/23 and 256K Memory.



CI-1220 — Dual drive, double density, double sided, 2MB capacity floppy plus DMA LSI 11 controller ...... \$2,695.00

**RT11 V4** — Operating System .... **\$1,085.00** 

**RSX11M** — Operating System ... **\$2,250.00** 



**CI-KDF11LK** — LSI 11/23 CPU, MMU, with 256KB Memory ...... **\$2,195.00** 

DON'T ASK WHY WE CHARGE SO LITTLE, ASK WHY THEY CHARGE SO MUCH.



# Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362 • 213-991-2254 TWX 910-494-1253 (CHRISLIN WKVG)

# Monte Carlo Card

THE DISTINGUISHABLE CARD FOR THE DISCERNING USER.

#### **FIVE FUNCTIONS ON A SINGLE BOARD**

- ★ 64K to 1 Megabyte RAM Memory
- ★ ONE IBM Compatible Centronics Parallel Port
- ★ ONE IBM Compatible RS-232 Serial Port
- ★ Clock/Calendar (Perpetual Time Keeper)
- ★ Dual-Port Joystick Interface
- Future Upgrade Option: Plug-On Direct Connect Modem
- The Clock/Calendar has full alarm features and 1/100th second timing.

This card is the Ultimate IBM Peripheral. See Your Local Dealer.

Available **NOW**  The Monte Carlo Card was ingeniously engineered to ensure that the maximum possible variety of the most sought-after features demanded by PC users was amassed upon a solitary board. Providing users with the best value for money, functionality, reliability, and flexibility, were our primary goals, which will enshrine the Monte Carlo Card as the premier expansion board for any PC user.

See Your Local Dealer or Call

# I-C Magic + SPOOLING

#### **GRAPHICS**

- Full Color or B/W Tones
- HIRES and Medium Res.
- 4-Dot Sizes for Blow-ups Reproduce Graphics from Screen to Dot Matrix Printer, Full Screen or Sub-Section
- Rotation, Color Hue Selection
- Shift PrtSc Graphic Dumps
- Color on Prism 132/80
- Operates on EPSON/NEC/C-ITOH PRISM/OKIDATA

- Selectable buffer
   1K to 64K
- Serial or Parallel
- True Background spooling at your fingertips
- Save processor time

SAVE MONEY

 Buffers all text and graphics

#### **TERMINAL**

- RS-232 Direct or Modem connection
- Full terminal capability on a chip! Printer Hardcopy/ Echo
- Full input/output buffering
- Background terminal features
- Easy for user customization

FOR YOUR IBM PC

IBM is a registered trademark of International Business Machines, Corp. MBI and I-C-Magic are trademarks of Microcomputer Business Industries, Corp.

**MICROCOMPUTER** 

**BUSINESS** 

INDUSTRIES

CORPORATION

ADMINISTRATIVE OFFICES: 1019 8TH STREET, GOLDEN, COLORADO 80401 (U.S.A.)

TELEPHONE: (303) 279-8438 Circle 269 on inquiry card.



S.A.) **TWX:** 910-934-0191

# Monte Carlo Card

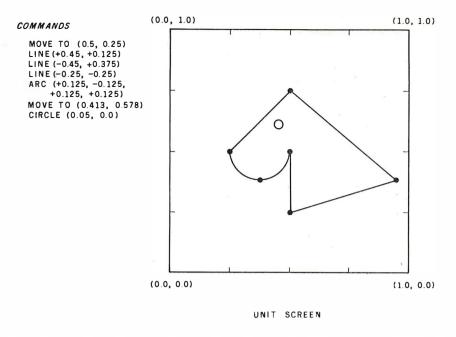
The distinguishable card for the discerning user

The only true FIVE function card for the IBM Personal Computer

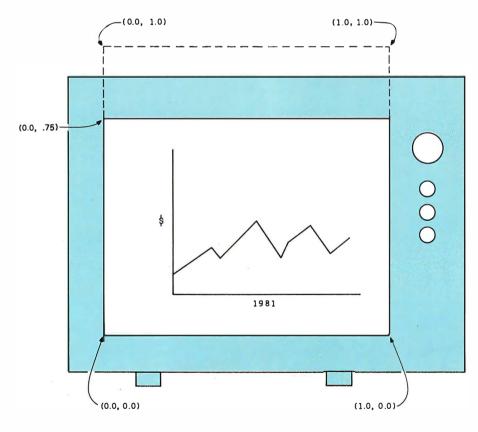
- 64K to 1 Megabyte of Memory ONE IBM Compatible Centronics Parallel Port ONE IBM Compatible Asynchronous Communications Port
  - Clock/Calendar (Battery Backed) with Alarm Features

Monte CarloBUSINESS

GOLDEN, COLORADO 80401 (U.S.A.)



**Figure 7:** The unit screen of NAPLPS. All coordinates are represented as fractions between 0.0 and 1.0. The figure on the screen was drawn with the commands listed on the left. The advantage of this coordinate scheme is that it can be easily implemented on display screens of various resolutions and sizes.



**Figure 8:** The unit screen is square, but most display screens are rectangular. The convention that has been adopted is to represent on the display screen only the lower 75 percent of the unit screen. That is, any point with a y coordinate greater than 0.75 will not be seen.

box you can record as well as play.)

As mentioned before, default selections have been set up so that no swapping commands are needed in many applications. As shown in figure 6, the ASCII character set is the default for the G0 designated set, and whatever is in G0 is the default for GL. Therefore, the codes in GL (decimal 32 to 127) will be mapped to the ASCII character set as the default condition. (Isn't it amazing how the simplicity of the present can be represented as a subset of the complexity of the future?)

The default for the G1 designated set is the PDI set, and G1 in turn is the default for GR. This arrangement allows text and graphics to be used without any swapping.

The default for G2 is the Supplementary Graphics Set, and the default for G3 is the Mosaic Set. We believe that the Macros and DRCS should have been the defaults. When you devise a standard, however, sometimes a little "default diplomacy" is necessary.

The entire NAPLPS code-extension structure is designed to support future growth in an organized manner. As can be seen, it provides a means of increasing the number of codes far beyond the 256 codes we would have had if there were no code-extension techniques. The overhead has been kept to a minimum while maintaining compatibility with existing ASCII systems.

#### The Unit Screen and Coordinate System

Now that we have plenty of room for character sets and commands, we can get down to the real purpose of NAPLPS—creating pictures.

In NAPLPS, pictures are drawn on a *unit screen*. As shown in figure 7, the unit screen is a square area of unknown resolution and size. The lower left corner of the screen has x-y coordinates equal to (0.0, 0.0); the upper right-hand corner of the screen has x-y coordinates of (1.0, 1.0).

The name "unit screen" is derived from the fact that all coordinates in the unit screen have an *x* and *y* component between 0.0 and 1.0. In NAPLPS, all coordinates and dis-

#### HERE'S THE PERSONAL **COMPUTER AD OUR COMPETITION DOESN'T WANT** YOU TO READ.

It's an ad for NEC's APC" Advanced Personal Computer. A solutions-oriented system that solves business problems in the simplest, most cost-effective way. The APC supports both CP/M-861\*\* and MS-DOS." It can store more information than any system in its price range. In short, it's got the best price/performance of any personal computer. That's why our competition would pr at you never see our syste

We asked som busiystems men who s us why t' ed us arly un reason s. They APC only p npute arket c voq 6-bit r sor disk ion disp oplicat t, the these affor 's w

> urs, ther. e sysgood couldn't

any that well as

em that s in the

"That APC of yours is the most powerful computer of a 35 I saw. I don't know hov for that price."

"Now that I've used it to awhile, I see why you name. Advanced Personal Computer.

And that from businessmen who have tested the etition! When you see the vou'll understand why, at, others, all of these bu picked NEC.

Our business software was optimized to take advantage of the APC's unique hardware features. That makes system operation faster and easier.

Our software includes a full set of general accounting packages, word processing, mailing list management, business planning, database management, and communications. And we're readying many more.

We're the only company to back our software with a unique nconditional guarantee. It will rk or you get your money ick.

Our high-resolution color graphics run circles, arcs and lines around everybody else. The A screen imagesline characters are unprecedented pi in their clarity. colors against resolution etitive systems often must.

compar he APC for pla alysis, dai nager. ord proce 's part 'al commu vork, i e the A nal fc ronic mi ces mput rieta datab ic an proc

A uni n give

Th models

The mc combines a black high-res 128K bytes of u a 1-million-byte fi keyboard and ma dard features you on competitive

#### mpetitive systems

See for yourself the personal computer our competition wishes had never been invented. The Advanced Personal Computer from NEC. Return the coupon to NEC Information Systems, Inc., 5 Militia Drive, Lexington, MA 02173.

# Now available with NEC hard disk.

APC is a trademark of Nippon Electric Co., Ltd. CP/M-86 is a trademark of Digital Research, Inc. MS-DOS is a trademark of Microsoft, Inc.

|       | Send me more information on the Advanced Personal Computer. | BE0283 |
|-------|-------------------------------------------------------------|--------|
| Name  | Address                                                     |        |
| Title | City, State, Zip                                            |        |

Telephone

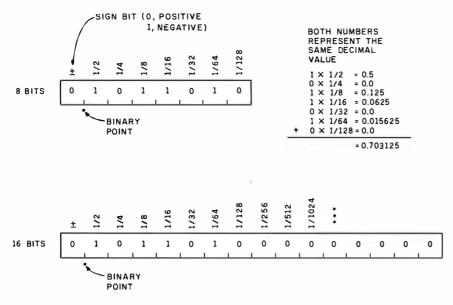
NEC Information Systems, Inc.

5 Militia Drive, Lexington, MA 02173

#### The Benchmark in World Class Computers

Circle 300 on inquiry card.

Company



FIXED-POINT BINARY FORMATS

**Figure 9:** NAPLPS coordinates are formatted as "fixed-point binary numbers." The 8-and 16-bit numbers given here represent the same decimal number, 0.703125.

tances are specified thus in subunits relative to the unit screen. The advantage of specifying the coordinates in this manner is that the pictures will be independent of any particular hardware configuration. Another advantage is that objects in pictures will remain in the same relative position with respect to each other even though the resolution of the physical display may be increased.

In order that pictures may be seen, the unit coordinates must be mapped to a physical display. The only requirement imposed (under normal conditions) when making this mapping is that the squareness (commonly called aspect ratio) of the unit screen should be preserved. Unfortunately, when the unit screen is mapped to the rectangular screen of a television set, some of the unit screen cannot be seen. This is shown in figure 8. The convention that has been adopted is that only the lower 75 percent of the unit screen will be visible on the physical screen. Thus, any point with a y coordinate greater than 0.75 (it is usually closer to 0.78) will not be displayed on a television screen.

This technique of mapping points on the unit screen to the physical screen is called one-to-one mapping. In the future, additional mapping techniques may be added to NAPLPS that will allow the unit screen to be scaled, rotated, and mapped to the physical screen in a variety of ways. These capabilities will be added at the same time that three-dimensional features are defined.

Now that we know that all coordinates must be between 0.0 and 1.0. a problem arises: How do we represent these coordinates? Floating-point representations could be used. But this would make it difficult for integer-oriented microprocessors to handle the coordinates. Instead of a floating-point format, a fixed-point binary (not binary-coded decimal or BCD) format was chosen. This format is the same as a typical integer format, except the binary point is assumed to be on the left between the sign bit and the data bits. Figure 9 illustrates the formats for 8- and 16-bit systems.

The important thing to note about this format is that, unlike integers, as more bits of precision are added, they are added on the *right* instead of the left. Also, the values of the binary places work from the left to the right. The value of the bit position immediately to the right of the binary point is 1/2. The next bit position to the right is worth 1/4. The next ones are worth 1/8, 1/16, 1/32, etc.

The decimal value of a number is determined in a manner similar to in-A number such as 0.1011010000000 represents a positive number (the sign bit of 0) equal to 1/2 + 1/8 + 1/16 + 1/64 or 0.703125, which of course is less than 1.0. An infinite number of zeros is assumed on the right of the number, just as with decimal numbers that are less than 1. Of course, the number will never equal 1.0 no matter how many 1s are placed on the right. (If you do not believe it, try figuring out what the fixed-point binary number 0.111111111111111 is in decimal.)

When coordinates are encoded in NAPLPS, each byte can contain 6 bits of data. (The other 2 bits will be accounted for later.) The standard two-dimensional format is shown on the left of figure 10 (page 227). On the right side of figure 10 is a three-dimensional format. Some three-dimensional capability is supported by NAPLPS today, but many more three-dimensional options will be available in the future. In that case, coordinates are specified in a unit cube rather than a unit screen.

In the two-dimensional format, the 6 data bits are used for 3 bits of x and 3 bits of y. Obviously, multiple bytes are needed if high-precision coordinates are used. As shown in figure 11, as each new byte is added to a coordinate specification, the x and y components each obtain 3 more bits of precision. The least significant bits are obtained after the most significant bits. A terminal may choose to throw away some of the least significant bits if more bits are sent than are needed for the resolution of that particular terminal.

When most people are first exposed to this method of coordinate encoding, their first reaction is that it will be too complex for a simple microprocessor to handle. On the contrary, there is a very easy way to handle this encoding technique: just ignore the binary point and the fractional concepts and treat the bits as integers.

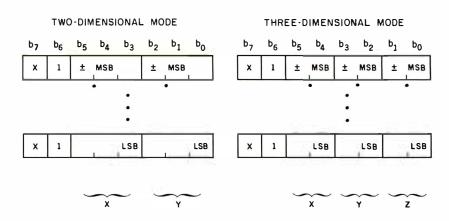
To do this, you must first choose an adequate integer size for internal representations. On 16-bit microprocessors, 16 bits are commonly used. If signed 16-bit numbers are used, a grid can be set up that ranges from -32,768 to 32,767 in both the x and y directions (see figure 12). The display screen or unit screen would occupy the first quadrant. The unit screen would then be 32,768 by 32,768, which is far more resolution than almost all graphics devices have to-day.

It should be clear that treating the fixed-point binary numbers as normal integers is the same as moving the binary point 15 places to the right (for a 16-bit system), which is the same as multiplying the binary fractions by 32,768. We can recover the fractional form by dividing by 32,768, which was demonstrated above.

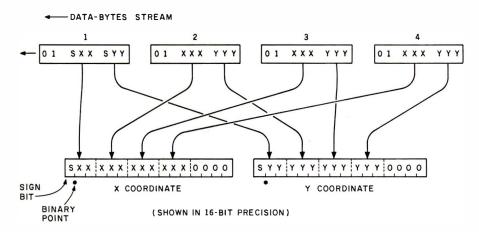
In order to map the unit screen to a physical display screen, more simple shifting can be used. The sign bits of the *x* and *y* components must be positive for the coordinate to be in the unit screen. If the rightmost 7 bits of the 16 bits above are dropped by shifting the integer right seven places, the numbers that result are in the range 0 to 255.

This operation maps the 32K-by 32K-bit grid to a 256 by 256 grid. Each point on the 256 by 256 grid then represents a 128 by 128 area on the original grid. This indicates that when 16-bit integers are used, 128 would have to be added to a coordinate component to move to a different point on the physical display.

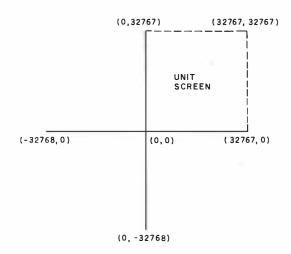
If a 512- by 512-bit-resolution display screen is available, another bit on the right of the coordinate integer would be saved. (The 16-bit integer would be shifted right six places instead of seven.) In this case, each point on the 512 by 512 grid



**Figure 10:** In NAPLPS, coordinates are specified with a varying number of bytes. In the two-dimensional mode, each byte contains 3 bits of the x coordinate and 3 of the y. In the three-dimensional mode, each byte contains 2 bits each for the x, y, and z coordinates. MSB indicates the most significant bit; LSB, the least significant bit.



**Figure 11:** The data bytes shown in figure 10 can be combined to specify coordinates of almost unlimited resolution. Here, 4 data bytes in the two-dimensional mode are combined to form a pair of 12-bit coordinates. This would support a resolution of 2048 by 2048



**Figure 12:** The maximum resolution of a 16-bit coordinate system. The unit screen occupies only the first quadrant of the grid.

| FLOPPY DISK DRIVES - 8"                                                                                    | PRICE QTY. ONE              |
|------------------------------------------------------------------------------------------------------------|-----------------------------|
| 242 - Half height DSDD 48TPI<br>842 - Full size DSDD 48TPI                                                 | 450.00<br>465.00            |
| TANDON TM-848-2 - Half height DSDD 48TPI MITSUBISHI                                                        | 465.00                      |
| M-2894-63 - Half height DSDD 48TPI                                                                         | 465,00                      |
| FLOPPY DISK DRIVES - 51/4"                                                                                 |                             |
| QUME  142 - Half height DSDD 48TPI  542 - Full size DSDD 48TPI  592 - Full size DSDD 96TPI                 | 195.00<br>260.00<br>335,00  |
| TANDON TM-100-2 - Full size DSDD 48TPI TM-100-4 - Full size DSDD 96TPI (For the IBM PC)                    | 255.00<br>365.00            |
| MITSUBISHI M-4853 - Half height DSDD 967PI 1MB M-4854 - Half height DSDD 967PI 1.6MB                       | 335.00<br>395.00            |
| WINCHESTER HARD DISKS AMPEX Pyxis 7-5½" 7MB capacity Pyxis 13-5½" 13MB capacity Pyxis 27-5½" 27MB capacity | 650.00<br>795.00<br>1225.00 |
| *** 1 year warranty **  WINCHESTER SUBSYSTEMS  MEDIA DISTRIBUTING  MD-10 - 11MB Capacity                   | 2695.00                     |
| MD-20 - 22MB Capacity For Z-80, CP/M Systems TERMINALS                                                     | 3595.00                     |
| ADDS VIEWPOINT - Green phosphor                                                                            | 479.00                      |
| D-80 - Green phosphor D-81 - Green phosphor Amber phosphor optional \$20.00                                | 595.00<br>625.00            |
| QVT-102 - Green phosphor QVT-103 - Green phosphor QVT-108 - Green phosphor                                 | 595.00<br>750.00<br>750.00  |
| PRINTERS QUME Sprint 11 - 40 CPS Daisy wheel                                                               | 1395.00                     |
| MPI                                                                                                        |                             |
| Printmate 150 A-1 - Serial, 4K buffer                                                                      | 999.00                      |
| MEDIA DISTRIBUTING                                                                                         |                             |



(408) 438-5454

SUPPLIES AND ACCESSORIES ALSO AVAILABLE **DEALER INQUIRIES INVITED** 

TERMS: COD, CASH WITH ORDER, MASTERCARD, VISA FREIGHT CHARGES WILL BE ADDED TO ALL ORDERS

represents a 64 by 64 area on the original grid. Adding 128 to an integer in this case would move the coordinates by two display points, not one. If this did not occur, pictures developed for a 256 by 256 grid would end up in the lower corner of a 512 by 512 display. That lack of portability would discourage increasing the resolution of the terminal. Fortunately, with NAPLPS we can increase the resolution of a display and still be able to receive pictures developed for older displays. They will look as good or better on the new display.

So far, we have discussed only positive coordinates and integers. Negative values can occur in the normal two's complement form used by most microprocessors. Negative values can be used to code relative coordinates (dx and dy values) when relative movements are needed. rather than absolute coordinates. The values dx and dy can also be used to indicate sizes of areas on the screen.

Part 2 of this series will describe how the dx and dy values are used to specify character sizes. We will also see that many of the graphics commands have an absolute form and a relative form. The absolute forms are used when the drawing must appear at a particular spot on the unit screen. Relative forms are useful when one wants to draw relative to the current drawing point, which may be in different places depending on the previous figure.

#### Color Control

NAPLPS supports a wide range of color control. Three color modes (0, 1, and 2) are available to satisfy many different applications. The first of these (color mode 0) is fairly simple and is designed to be compatible with almost all color display screens. The other two (color modes 1 and 2) use what is known as color mapping. This allows you to create some fantastic visual effects, but this technique requires special hardware not found in most color displays.

Color mode 0 is the most primitive mode in NAPLPS. It can best be described by the following analogy using the robot mentioned at the

# **COMPLETE SUBSYSTEMS** ■ The MD-10, an 11 MB formatted system for \$2695. The MD-20, a 22 MB formatted system for \$3595. ■ The MD-44, a 44 MB formatted system for \$4395. ■ Interfaces with any Z-80, CP/M\* system as well as 8085/8086 and IBM PC\*. Software includes SOURCE CODE and enhanced utilities. Simple installation. ■ Networking option; tape back-up option. OR DRIVES, OFF THE PALLET ■ Unformatted disk drives at 7MB (\$650, quantity one); 13MB (\$795, quantity one); 20MB (\$950, quantity one), and 27MB (\$1225, quantity one). ■ 90 millisecond average access time. ■ Maintenance-free operation. ■ An AMPEX one-year warranty. MEDIA DISTRIBUTING **DEALER INQUIRIES INVITED** 'Registered trademarks of Digital Research, Inc. and IBM Corporation.

MEDIA DISTRIBUTING 4444 Scotts Valley Drive Scotts Valley, CA 95066

408/438-5454

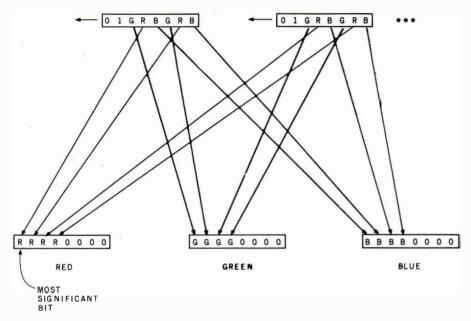
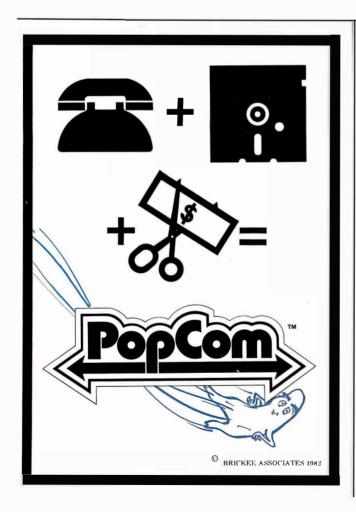
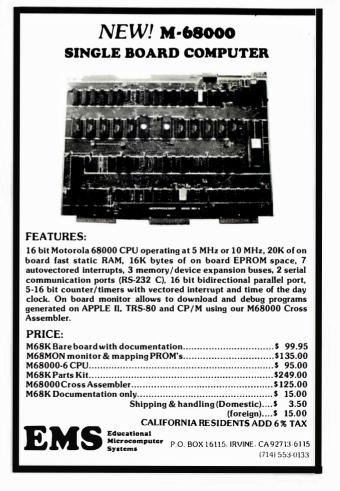


Figure 13: Color information is encoded in a manner similar to that used for coordinates. Each data byte contains 2 bits of information for each of the primary color components: red, green, and blue. A varying number of bytes can be combined to specify colors with almost unlimited precision. Here, 2 data bytes have been combined to yield 4 bits of information on each red, green, and blue component of a color.

beginning of the article. Imagine that the robot has one pen and three inkwells filled with the primary colors red, blue, and green. By mixing various amounts of each of these colors in the pen, the robot can draw in almost any color. For example, we could instruct the robot to mix three drops of red, one drop of blue, and seven drops of green, and then tell the robot to draw various shapes or text characters. When we tell the robot to mix a new color, the robot would automatically clean out the pen and mix the next color.

In NAPLPS, color is similarly specified in terms of its red, green, and blue intensities. Each byte of color data contains 6 bits of color information, 2 each for red, green, and blue. Several bytes, however, can be grouped together so that colors can be specified with as much precision as desired. In figure 13, 2 bytes have been used to yield a total of 12 bits of color information (i.e., 4096 possible colors). As with coordinate encoding,





# NEW LOW-COST ENGINEERING/BUSINESS PLOTTER



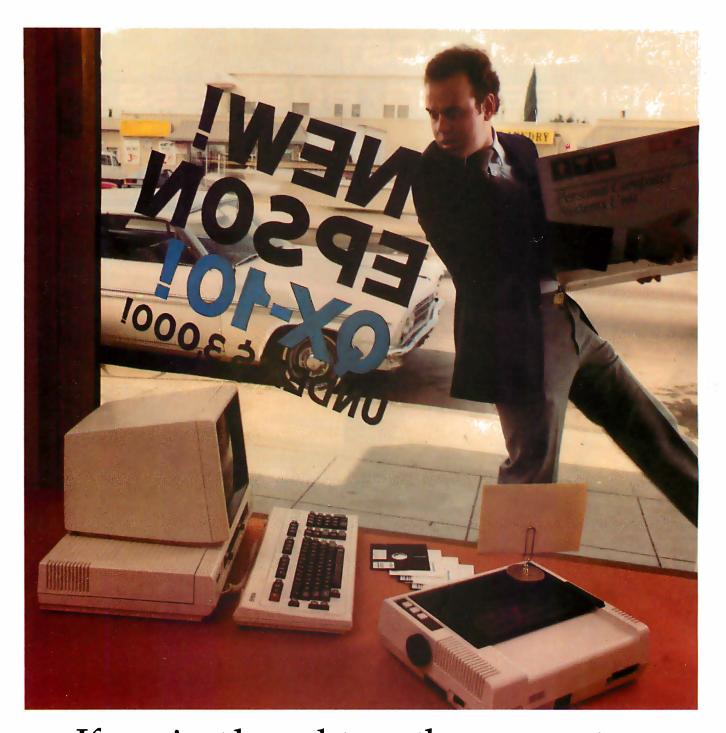
#### Cost-effective "originals"

The Model DXY is an economical multi-pen, X-Y coordinate plotter that produces hard copy graphics in minutes for all types of business applications and technical disciplines. Priced at under \$1000, it's compatible with the IBM, Apple and other personal computers. It has built-in software (expandable ROM) to interpret "Basic" commands. Just call, or write for complete specifications on the Model DXY Plotter. Ideal for end-user or OEM applications.

- 10" x 14" effective plotting range.
- Centronics interface for easy connection to your computer.
- Pens, penholders, chart hold-downs, and dust cover are included.
- Charts on popular graphics media including vellum and mylar.

2201 Lively Blvd. • Elk Grove Village, IL 60007 (312) 364-1180 TLX: 25-4786





If you just bought another computer, boy are you gonna be sorry.

Epson.

The new Epson QX-10 is unlike any personal computer you've ever seen. It's a computer for people who don't have the time to learn computers; a computer you can be using within minutes.

And fortunately, you don't have to take our word for it. Here's how *Byte*, one of the computer industry's most prestigious magazines, describes the OX-10.

The first anybody-can-use-it computer.

"The Epson QX-10 (is) a computer for less than \$3000 that may well be the first of a new breed of anybody-can-use-it 'appliance' computers . . . In addition to being a highly integrated word processing/computer system that offers as much usable processing

power as almost any existing microcomputer, the QX-10 ... system is designed to be used by people with minimal technical knowledge. We've certainly heard that claim before, but Epson has delivered on this promise in a way and to an extent that no microcomputer manufacturer has done."

That's nice to hear from a magazine like *Byte*, of course, but it doesn't surprise us. It's just what we intended the QX-10 to be all along.

#### More computer. Less money.

But useability isn't the only thing the QX-10 has going for it. As *Byte* says, "the QX-10 gives you a great deal for your money.

"Help is available at any time through the HASCI (Human Application Standard Computer Interface) keyboard Help key... Text can be entered at any time just as you would in a conventional word processor. The Calc key turns the system into a basic

4-function calculator. Graphics can be created via the Draw key. The Sched (schedule) key gives you access to a computer-kept appointment book, a built-in clock/timer/alarm, and an event scheduler."

#### Advanced hardware for advanced software.

As for hardware, *Popular Computing*, another industry leader, says: "The QX-10 includes...a number of advanced hardware features... The basic components of the system are a detachable keyboard, a high resolution monochrome display, and a system unit containing two 5¼ inch disk drives. The drives use double-sided, double-density disks (340K bytes per disk) and are amazingly compact ... The QX-10 uses an 8-bit Z80A microprocessor. The system contains 256 bytes of RAM. Some of the RAM is ... battery powered ... which lets the computer retain information when the power is off."

#### You won't have to wait much longer.

The new Epson QX-10 may very well be the computer you've been waiting for. And fortunately, you won't have to wait much longer — it will be appearing soon in computer stores all across the country. In the meantime, write Epson at 3415 Kashiwa Street, Torrance, CA 90505, or call (213) 539-9140. We'll be happy to send you copies of our reviews.

After all, as *Popular Computing* puts it, the QX-10 will "do for computing what the Model T did for transportation."

And we couldn't have said it better ourselves.





3415 Kashiwa Street Torrance, California 90505 (213) 539-9140

Circle 171 on inquiry card.

# We Have It! Terminals, Printers & Monitors

#### **TeleVideo**



#### 925C

Protected fields, optional 2nd page of memory, visual attributes, tilt-swivel screen (non-glare P31 green), 25th status/user line, time of day, can emulate 912/920, RS232C printer port, 50 Baud to 19.2KB., 8x10 character resolution, switchable character sets, function keys self test

| 910C   | <br> | <br> |      |      |  | <br> |  |  |  |  | \$ | ÷595 |
|--------|------|------|------|------|--|------|--|--|--|--|----|------|
| 910C + | <br> |      | <br> |      |  |      |  |  |  |  |    | 595  |
| 912C   | <br> | <br> |      | <br> |  | <br> |  |  |  |  |    | 739  |
| 920C   | <br> |      |      | <br> |  | <br> |  |  |  |  |    | 789  |
| 925C   | <br> |      |      | <br> |  | <br> |  |  |  |  |    | 789  |
| 950C   |      |      |      |      |  |      |  |  |  |  |    | 989  |

#### **HAZELTINE**



| Esprit I       | \$499 |
|----------------|-------|
| Esprit II      | Call  |
| 1420           | . 595 |
| 1500           | . 949 |
| 1510           | 1089  |
| 1520           |       |
| Exec. Basic 20 |       |
| Exec. Basic 30 | 1189  |
| SOROC          |       |

#### **TI CRT Terminals**

SOROC IQ-130 . . . . . . . . . . . . .

| 940, | Basic    |  |  |  |  |  |  |  |  |  |  |  | \$15  | 99 |
|------|----------|--|--|--|--|--|--|--|--|--|--|--|-------|----|
| 940, | Package. |  |  |  |  |  |  |  |  |  |  |  | . 207 | 79 |

#### **LEAR SIEGLER**

| ADM 22. | <br> |      | <br> |  |  |  |  |  |  | 4 | 595 |
|---------|------|------|------|--|--|--|--|--|--|---|-----|
| ADM 3A. | <br> | <br> |      |  |  |  |  |  |  |   | 535 |
| ADM 5A. | <br> | <br> |      |  |  |  |  |  |  |   | 579 |

### **TEMITH** data systems

Z-19 Video Terminal



#### **OKIDATA**

| Microline 80, Parallel           | , \$359 |
|----------------------------------|---------|
| Microline 82A Serial & Parallel  | 459     |
| Tractor Option, 80 & 82A         | 50      |
| Microline 83A, Serial & Parallel | 729     |
| Microline 84, Parallel           | . 1149  |
| Microline 84, Serial             | . 1249  |
| Okigraph 82A                     | 85      |
| - •                              |         |

#### **DIABLO**

| 630 RO                            | \$2299 |
|-----------------------------------|--------|
| 630 R155, (All purpose interface) | . 1998 |
| 630 KSR                           | . 2825 |
|                                   |        |

#### QUME

#### **CENTRONICS**

| <b>737-3</b> , RS232C            | New Low!\$389 |
|----------------------------------|---------------|
| <b>730-1</b> , Parallel          | New Low!\$349 |
| <b>704-9</b> , 150 CPS (RS 232C) | 1595          |
| 704-11, 150 CPS Parallel         | 1695          |
| 122G 120 CPS Parallel            | 949           |

#### **NEC Spinwriter**



| 3510 RO, 35 CPS                           | 95 |
|-------------------------------------------|----|
| 3530 RO, 35 CPS (Centronics Interface) 18 | 59 |
| 7710 RO, (RS232C) 55 CPS 23               | 75 |
| 7720 KSR (RS232C) 55CPS 27                | 95 |
| 7730 RO, 55CPS (Centronics Interface) 23  | 75 |

#### IDS

INTEGRAL DATA SYSTEMS



| •                    |                   |
|----------------------|-------------------|
| IDS 445G             | . Special / \$599 |
| MICROPRISM           | 599               |
| PRISM 80, Basic      | Call              |
| PRISM 80, w/o color  | 1149              |
| PRISM 80, w/color    | 1499              |
| PRISM 132, Basic     | Call              |
| PRISM 132, w/o color | 1469              |
| PRISM 132, w/color   | 1695              |
| -                    |                   |

#### **Texas Instruments**



| The second secon |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| TI 810, Basic\$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1349 |
| TI 810, VCO, ASC II Full                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1599 |
| TI 810, Enhanced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1950 |
| TI 810, VCO/Full Enhanced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2099 |
| TI 820, RO w/LC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1645 |
| TI 820, RO w/comp. print, DFC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1795 |
| TI 745, Portable Terminal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1399 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |

#### **EPSON**

| MX-80                      | <b>\$489</b> |
|----------------------------|--------------|
| MX-80FT                    | . 589        |
| MX-100FT                   | . 789        |
| <b>RS232</b> , w/4K Buffer | . 135        |

#### **C.ITOH**

| ProWriter 8510, Parallel              | \$549 |
|---------------------------------------|-------|
| ProWriter 8510 ACD, Parallel & Serial | . 649 |
| ProWriter 1550, Parallel              | . 789 |
| ProWriter 1550, Serial                | . 845 |
| F-10, Parallel or Serial              | 1599  |
| Daisy Wheel Tractor, For F-10         | . 275 |

#### **ANADEX**

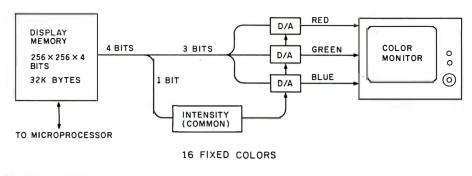
| DP-9000A/01A. |  |   |  |   |  |  |   |   |   |  |  |  | , | \$1429 | ) |
|---------------|--|---|--|---|--|--|---|---|---|--|--|--|---|--------|---|
| DP-9500A/01A. |  |   |  |   |  |  |   |   |   |  |  |  |   | 1429   | 1 |
| DP-9620A      |  | _ |  | _ |  |  | _ | _ | _ |  |  |  |   | 1569   | , |

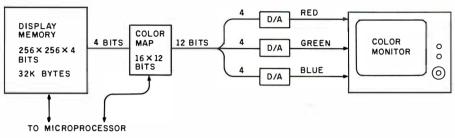
# MiniMicroMart,Inc.

943 W. Genesee St. P.O. Box 2991 B Syracuse, New York 13220 (315) 422-4467



All prices F.O.B. shipping point, subject to change. All offers subject to withdrawl without notice. Advertised prices reflect a 2% cash discount (orders prepaid prior to shipment). C.O.D.'s & Credit Cards, 2% higher.





4096 VARIABLE COLORS

**Figure 14:** Two popular schemes for storing color information. Both use the same amount of display memory. In the top scheme, the 4 bits for each pixel specify 16 fixed colors. In the lower scheme, the 4 bits specify 16 color registers in the color map. Each color register in turn specifies one of 4096 colors. D/A designates a digital-to-analog converter.

the most significant bits are sent first, and a terminal is free to ignore the least significant bits.

With this kind of system, a tremendous spectrum of colors may be displayed, depending on the amount of memory available.

Most personal computers have only a small number of colors available. In the above analogy, the robot might have 8 or 16 pens with premixed colors. When we gave the robot instructions to mix a certain color, it would merely pick the pen with the color closest to the specified color.

The advantage of color mode 0 is that it can be received on almost all terminals. An inexpensive color terminal can display the same picture—although much less vividly—as an expensive, dedicated graphics terminal.

Color mapping, which is used in color modes 1 and 2, allows a terminal to display a wide spectrum of colors without requiring a large amount of memory. The Atari 400 and 800 are two of the few home computers that make use of this technology (see "Computer Anima-

tion with Color Registers" by David Fox and Mitchell Waite, BYTE, November 1982, page 194).

In color mapping, if we return to the above analogy, the robot has the three primary-color inkwells again and a set of, say, 16 pens numbered 0 through 15. Using NAPLPS, we can instruct the robot to mix various col-

With NAPLPS, an inexpensive color terminal can display the same picture—although much less vividly—as an expensive, dedicated graphics terminal.

ors in each of the pens. We can then instruct the robot to draw with a given pen, referring to it by its number rather than by its color. In a computer, we would store the color information not in a pen, but in a color register as part of a color map or color table.

In figure 14, we compare a system using fixed colors with one using color mapping. Both have the same amount of display memory (32K bytes). In the fixed-color system, the 4 bits in memory for each pixel specify one of 16 combinations of red, green, blue, and intensity. In the color-mapped system, the 4 bits refer to one of 16 color registers, each of which in turn refers to one of 4096 combinations of red, green, and blue.

Another important advantage of color mapping is that if we instruct the robot to change the color in a given pen, everything previously drawn with that pen will also change color. This amazing capability can be used to create some dramatic animation effects. These effects are typically referred to as color-table animation

Color-table animation is a very complex area of NAPLPS. A mechanism has been provided that allows you to specify color interchanges in the color map based on timed relationships. (This command has been given the innocuous name BLINK.) Time intervals can be set in units of ½0 of a second, which allows compatibility with 60-Hz (U.S.) and 50-Hz (Europe) systems. Color-table animation will be discussed in greater detail in the third part of this series.

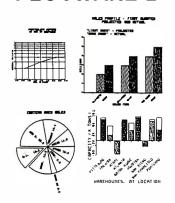
As we mentioned before, the major drawback of color modes 1 and 2 is the dependence on special hardware to achieve the full capabilities of the modes. This drawback was known at the time NAPLPS was designed, but it was determined that because of the incredible special effects that can be achieved using these modes they would be included. Anyone who does not have a need for these special effects should concentrate on using color mode 0 to insure portability of information.

#### **Text Features**

Text is handled as a subset of graphics. Text is a special form of graphics that involves predefined "templates" that are rectangular in shape. The rectangular templates can be scaled to any size and positioned anywhere on the unit screen. The

#### CP/M GRAPHICS SOFTWARE

#### **PLOTWARE-z**



# On ALTOS, APPLE, OSBORNE, ZENITH, and most others.

#### THE MOST COMPLETE:

Use THREE ways:

- 1. "MENU" GRAPHICS (easy, friendly)
- 2. "COMMAND FILES" (powerful, flexible)
- 3. "COMPILER LINKED" (Fortran, etc.)

Use on: most CRT's, dot matrix printers, plotters, word processing printers

#### THE MOST PROVEN:

2 years in the field

#### THE MOST IMPLEMENTED:

- 1. 8 bit and 16 bit machines
- 2. USER MODIFIABLE
- 3. many applications programs

**\$399** complete **\$35** manual only

VISA, MC, C.O.D., CHECK, M.O.

#### THE ENERCOMP COMPANY

P.O. Box 28014 Lakewood, Colorado 80228 (303) 988-1648

Also Available Through



25 Van Zant Street • Norwalk, Connecticut 06855 (203)853-6880 • Telex 643788

and selected dealers.

|                |                | ñ          |    |     |    |   |   | ¥ |   |   |
|----------------|----------------|------------|----|-----|----|---|---|---|---|---|
|                |                |            |    | Þ6  | 0  | 0 | 1 | 1 | ì | 1 |
|                |                |            |    | b5  | 1  | 1 | 0 | 0 | 1 | 1 |
|                |                |            |    | b4  | 0  | 1 | 0 | 1 | 0 | 1 |
| b <sub>3</sub> | b <sub>2</sub> | <b>b</b> 1 | bo |     | 2  | 3 | 4 | 5 | 6 | 7 |
| 0              | 0              | 0          | Ó  | 0   |    | 0 | @ | Р | , | р |
| 0              | 0              | 0          | 1  | 1   | !  | 1 | А | Q | a | q |
| 0              | 0              | 1          | 0  | 2   | 11 | 2 | В | R | b | r |
| 0              | 0              | 1          | 1  | 3   | #  | 3 | С | S | С | S |
| 0              | 1              | 0          | 0  | 4   | \$ | 4 | D | Т | d | t |
| 0              | 1              | 0          | 1  | 5   | %  | 5 | E | U | е | u |
| 0              | 1              | 1          | 0  | 6   | 8. | 6 | F | V | f | v |
| 0              | 1              | 1          | 1  | 7   | /  | 7 | G | w | g | w |
| 1              | 0              | 0          | 0  | 8   | (  | 8 | Н | x | h | × |
| 1              | 0              | 0          | 1  | 9   | )  | 9 | 1 | Y | i | у |
| 1              | 0              | 1          | 0  | 10  | *  | : | J | Z | j | z |
| 1              | 0              | 1          | 1  | -11 | +  | ; | К | [ | k | { |
| 1              | 1              | 0          | 0  | 12  | ,  | < | L | \ | I |   |
| 1              | 1              | 0          | 1  | 13  | -  | = | М | ] | m | } |
| 1              | 1              | 1          | 0  | 14  |    | > | N | ^ | n | ~ |
| 1              | 1              | .1         | 1  | 15  | /  | ? | 0 |   | 0 |   |

**Figure 15:** The Primary Character Set, which is very similar to ASCII. Note that bit 7 is not shown. The value of bit 7 would depend on which graphics area (GL or GR) this G-set was placed in.

# If you think good software has to be expensive, think again!

#### **CP/M® DATABASE**

TARBELL DATABASE SYSTEM consists of a series of programs that use a common file format. These programs perform often-used functions in an interactive atmosphere. They are provided in both BASIC source form and COM file form, and can be run immediately with no other software except CP/M.

#### **FEATURES**

• 3 times faster than previous version • CB80 language source and COM files included • extensive HELP system • up to 19 files open at once • automatic record lockout on MP/M® • No limit on length or number of records • variable length fields • field names of any length • sequential or random files • optional BTREE index files • REPORT generator prints from multiple files • MENU • 12-digit BCD numeric precision • automatic Julian calendar conversion

#### **DBQUERY FEATURES**

- improved query language scope parameters, including NEXT n, REST, ALL WHILE and UNTIL to stop scanning on a condition • AND and OR operators for condition phrase
- RUN a command file from disk
   DEFINE macro substitution capability
   arithmetic operators: + - \* / ^with the usual meanings • functions include FRE, SQR, EXP, LOG, SIN, COS, TAN, RECNO (current record number), and RESULT (of last SUM or COUNT)



#### DISK CACHE MEMORY I/O SYSTEM SOFTWARE

System keeps the most recently used disk sectors in memory for quick access. Transfers are made to and from disk directly with memory, using Direct Memory Access (DMA) and extended address features on TARBELL Double Density Floppy Disk Interface. System increases overall speed of operation 2-to-4 times for CP/M and 2-to-3 times for MP/M. Speed of random access operations is increased even more than sequential operations. Output System (BIOS) automatically updates disk with latest changes. Disk Cache System requires no change in operating procedures. It does require the Tarbell CPU I/O Board.

CP/M BIOS CACHE-C MP/M XIOS CACHE-M

#### TARBELL BASIC

TARBELL BASIC helps provide speed, debugging, file locating and tailoring to requirements. As interpreter it allows quick debugging online, rather than having to move back and forth through editing, compiling and running. By obtaining source as listing or on CP/M disk, programmer can remove all portions of interpreter not required.

#### TBASIC FEATURES

- alphanumeric line labels assignment of I/O
- PUT and GET string and numeric data unlimited length variable names and strings • procedures with independent variables • up to 64 files open at one time

DISK OR CASSETTE

Other TARBELL software available includes Inventory and Sales Order Entry packages — both in Ashton-Tate's DBASE-II. Ask for a demo at your nearest TARBELL dealer.



950 Dovlen Place, Suite B Carson, CA 90746 (213) 538-4251

Circle 401 on inquiry card.

MANUFACTURER OF COMPUTERS. **COMPONENTS AND SOFTWARE** 

|    |                |            |                | b6 | 0        | 0   | 1             | 1             | 1  | 1  |
|----|----------------|------------|----------------|----|----------|-----|---------------|---------------|----|----|
|    |                |            |                | b5 | 0        | 1 1 | 0             | 0             | 0  | 1  |
| b3 | b <sub>2</sub> | <b>b</b> 1 | b <sub>0</sub> |    | 2        | 3   | 4             | 5             | 6  | 7  |
| 0  | 0              | 0          | 0              | 0  | =10      | 0   | <u> </u>      | -             | Ω  | к  |
| 0  | 0              | 0          | 1              | 1  | 1        | ±   | ` ]           | 1             | Æ  | æ  |
| 0  | 0              | 1          | 0              | 2  | ¢        | 2   | ,             | R             | Ð  | đ  |
| 0  | 0              | 1          | 1              | 3  | £        | 3   | ^             | 0             | a  | ঠ  |
| 0  | 1              | 0          | 0              | 4  | \$       | х   | ~             | T. <b>M</b> . | Ħ  | ħ  |
| 0  | 1              | 0          | 1              | 5  | ¥        | μ   | I             | ٨             |    | _  |
| 0  | 1              | 1          | 0              | 6  | #        | П   | (             |               | IJ | ij |
| 0  | 1              | 1          | 1              | 7  | §        | •   | •             |               | Ŀ  | ŀ  |
| 1  | 0              | 0          | 0              | 8  | ¤        | ÷   | ••            |               | Ł  | t  |
| 1  | 0              | 0          | 1              | 9  |          | ,   | /             |               | Φ  | ф  |
| 1  | 0              | 1          | 0              | 10 |          | ,,  | ٥             |               | Œ  | œ  |
| 1  | 0              | 1          | 1              | 1  | <<       | >>  | ,             |               | ol | β  |
| 1  | 1              | 0          | 0              | 12 | -        | 1/4 |               | 1/8           | Þ  | þ  |
| 1  | 1              | 0          | 1              | 13 | <b>†</b> | 1/2 | "             | 3/8           | Ŧ  | ŧ  |
| 1  | 1              | 1          | 0              | 14 |          | 3/4 | e             | 5/8           | ŋ  | ŋ  |
| 1  | 1              | 1          | 1              | 15 | <b>1</b> | خ   | <u>و</u><br>۷ | 7/8           | 'n |    |

Figure 16: The Supplementary Character Set of NAPLPS.

"pattern" on the template is transferred to the screen, overwriting only those areas drawn with the template.

As mentioned earlier, NAPLPS currently specifies three fixed character sets and one redefinable

character set. The Primary Character Set (ASCII) is shown in figure 15 on page 236. Most text is taken from this set. The ASCII character set is the default for the G0 and GL sets in figure 6. Therefore, it is accessed via

the usual codes, 32 through 127 decimal.

A Supplementary Character Set has also been specified in NAPLPS (see figure 16). This character set contains a smorgasbord of symbols and international characters. Most applications will require only a few of these symbols. This character set is the default for the G2 designated set, and must be moved to GL or GR before these characters can be accessed.

The Mosaic Character Set is the third of the fixed sets (see figure 17 on page 242). Although the Mosaic characters do not look like text characters, they are treated exactly like text because of their rectangular shape. The Mosaics have very little use because of the extensive graphics capabilities contained in NAPLPS. The Mosaics are the default for the G3 designated set. Thus, they cannot be directly accessed without a G-set change. (We should have made it harder than that to use.)

The fourth text set in NAPLPS is the Dynamically Redefinable Character Set (DRCS). The templates in this character set are initially blank rectangles. We can define each template, however, by using NAPLPS to draw a pattern on the unit screen and mapping that pattern to the template. The pattern can be drawn with either graphics or text commands. Once the template is defined, it can be used just like any other character. (Yes, existing DRCS characters can even be used to define a new DRCS character.) Thus, the 96 characters in the DRCS set can be used to create custom fonts and special symbols.

NAPLPS provides a variety of textoriented features, which can be applied to any of the four text sets. Figure 18 on page 244 illustrates many of the available capabilities. In parts 2 and 3 of this series, we will describe how these features are selected and applied.

#### **Graphics Features**

The graphics instructions (or primitives) are specified using codes from the Picture-Description Instruction (PDI) G-set. As shown in figure 19 on page 246, the PDI G-set is a 96-character set that is divided into

# With ASCOM...



# personal computer communication has never been this easy.

That's why Big 8 accounting firms and Fortune 500 companies use ASCOM.

ASCOM is an interactive microcomputer telecommunications program for timesharing and data transfers. It is easy to use because it employs menus, simple commands and features an online help facility.

A typical use of ASCOM is to access a data base to retrieve data for storage and analysis on your microcomputer. It can also be used to transmit program files to another machine running ASCOM. This can be done locally through direct connection, or over telephone lines by using a modem.

ASCOM works on IBM PC, MS-DOS, CP/M-86, and CP/M-80 compatible micros.

#### **WESTICO**

Address\_

25 Van Zant Street • Norwalk, CT 06855 (203) 853-6880 • Telex 643-788

Dial up our 24-Hour Computer Hotline for 300 baud modems: (203) 853-0816

- ☐ Please send me an ASCOM program &
- documentation: \$175.00 \*

  The ASCOM documentation only: \$30.00 \*
- FREE: Catalog of over 250 available programs.

C.O.D.\_\_\_\_\_Visa\_\_\_\_MasterCard\_\_\_\_ Card No.\_\_\_\_\_Exp.\_\_\_

Model of Micro\_\_\_\_\_51/4"\_\_8"\_ Name

Company \_\_\_\_\_ Tel:\_\_\_\_

City\_\_\_\_St.\_\_\_Zip\_\_\_\_\_ (\*Plus \$3.00 shipping and handling in N. America. Ct. residents add 71/2 % sales tax.)

ASCOM is a trademark of Dynamic Microprocessor Associates. CP/M is a trademark of Digital Research © Copyright 1983 Westico, Inc.

A WA+2

#### **ASCOM features:**

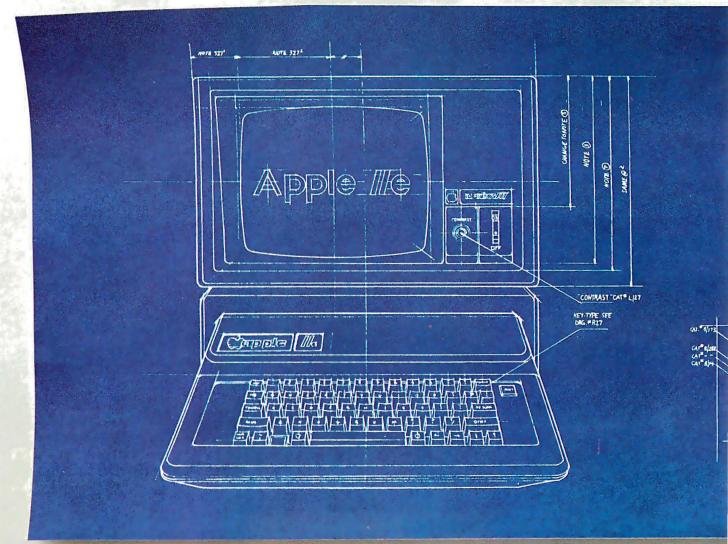
- Works with modems or by direct connection at speeds from 110 to 19,200 baud.
- Transfers both text and program files between computers.
- Protocols to synchronize large file transfers.
- Remote mode permits control of another micro running ASCOM.
- Automatic processing with command files.
- Commands for displaying directories and files.

To order ASCOM, call or write today:

WESTICO
The Software Express Service

25 Van Zant Street • Norwalk, CT 06855 (203) 853-6880 • Telex 643-788

# It's the same old Apple II.



For years, people have been trying to build a better Apple\* II. It finally happened.

Meet the Apple IIe, an impressive new version of a most impressive machine.

The "e" means enhanced. Which means a bundle of new features:

A standard memory of 64K (versus 48K) that's easily

expandable. So you can create fatter files and crunch larger numbers of numbers.

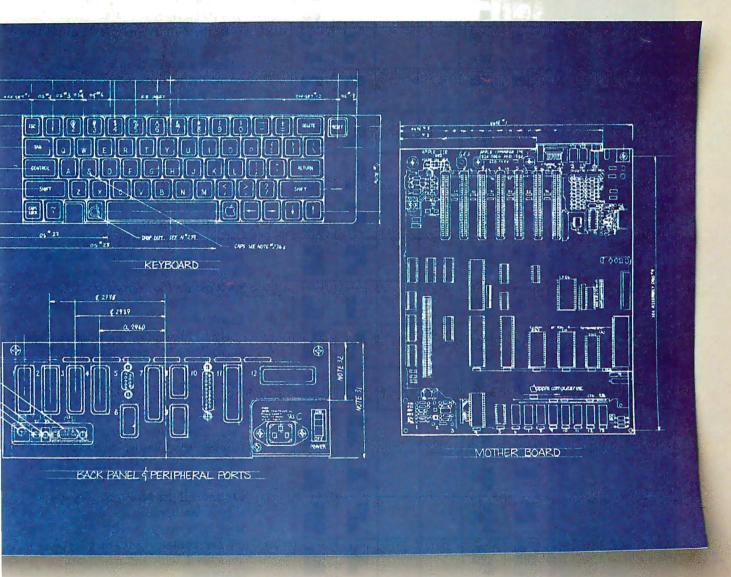
A new, improved keyboard, with a complete set of ASCII standard characters. Plus full cursor controls, programmable function keys, and a rapid auto-repeat feature built into every key on the board.

Both upper and lower case

characters. (And if you want to see more of them on the screen at one time, a low cost 80-column text card is available.)

Improved peripheral ports. Which make it a lot easier to connect and disconnect game controllers, printers and all those other wonderful things that go with an Apple Personal Computer.

# Except for the front, back and inside.



Self-diagnostics. That's a special feature that makes it easy to give your computer a thorough check-up.

Plus an even more reliable design. Achieved by reducing the number of components—which is to say, the number of things that could go wrong.

And bear in mind, the IIe still has all those other virtues that made the Apple II so very popular. Including access to more accessories, peripheral devices and software than any other personal computer you can buy.

So visit any of our over 1300

authorized dealers, and see the newest Apple for yourself.

Like the original, it's rather extraordinary. But then some things never change.



The most personal computer.
Circle 26 on inquiry card.

Call (800) 538-9696 for the location of the authorized Apple dealer nearest you, or for information regarding corporate purchases through our National Account Program. In California (800) 662-9238. Or write Apple Computer Inc., Advertising and Promotion Dept., 20525 Mariani Ave., Cupertino, CA 95014. © 1983 Apple Computer Inc.

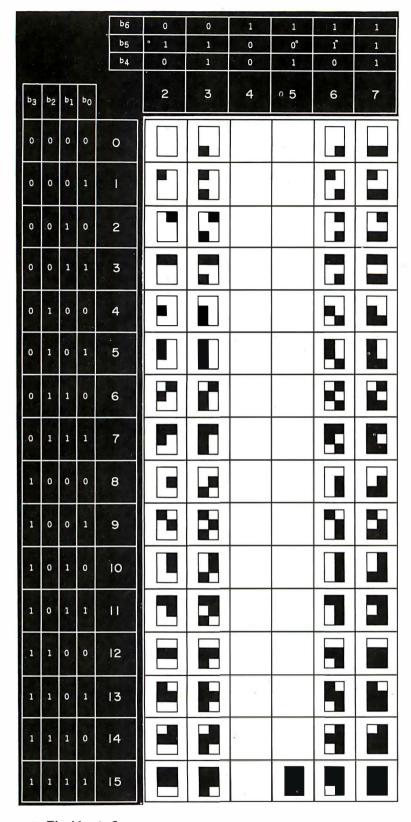


Figure 17: The Mosaic Set.

two smaller sets. The first 32 characters are graphics operation codes. These op codes are used to specify text control, drawing primitives, and color control.

The 64 codes in the right four col-

umns of the PDI G-set are used to encode data for these op codes. These data bytes are encoded and interpreted according to the preceding op code. Six bits are available for information in each byte. Many of the op

codes require multiple data bytes to encode one data item. Coordinates, for example, are typically encoded in 3 consecutive data bytes.

As shown in figure 20 on page 250, this distinction of op codes and data within the PDI G-set leads to a convenient decoding structure. Once it has been determined that a code falls in the PDI set, bit 6 (the seventh from the right) can be used to determine if an op code is specified or data. If bit 6 is 0, the byte is interpreted as an op code; if it is 1, it is a data byte.

Such a distinction is necessary because the picture-description instructions have been set up so that a variable amount of data can follow an op code. The bytes following the op code are assumed to be data as long as bit 6 is a 1.

Figure 21 on page 250 illustrates how text, graphics, and color can be integrated to draw a simple picture. Approximately 180 bytes of NAPLPS were needed to specify this picture. In parts 2 and 3, we will describe in detail how graphics commands for such pictures are encoded.

#### Control

Up to this point, the emphasis has been on the 96-character G-sets. Two C-sets (control sets), C0 and C1, are also specified in NAPLPS. These control sets contain the codes needed to accomplish the G- and C-set swapping. They also contain codes for moving the cursor, controlling the DRCS, clearing the screen, and so on.

Figure 22 on page 252 illustrates the C0 and C1 control sets. The C0 set should be familiar to those of you who have worked with ASCII. The C1 set contains a variety of codes associated with the new features of NAPLPS.

A mechanism has been provided, but not used, that allows C-sets to be changed like G-sets. The C-sets were originally going to be used whenever a small (fewer than 32) number of similar codes were added to NAPLPS. As it turns out, the 96-character G-sets have proven to be more useful. The C-sets have ended up becoming a catchall for codes that do not seem to "fit" (either physically or logically) anywhere else. This



# from the 8 bit 6809 microprocessor allowing it to outperform many 16 bit systems

With the UniFLEX™ Operating System, the 8 bit 6809 microprocessor can perform as well as larger CPUs in a multiuser, multi-tasking environment.

Independently developed from the ground up, UniFLEX™ closely models the features found in the UNIX™ Operating System. And in two years of use, UniFLEX™ has proven the abilities of the 6809 to perform large system functions when incorporated into a properly designed mainframe.

Some of the features supported include:

- full multi-user, multi-tasking capabilities
- hierarchical file systems
- device independent I/O
- four Gigabyte disk capacities
- full file protection
- inter-task communication via pipes
- I/O redirection
- task swapping for efficient memory usage
- full random-access files
- comprehensive shell command language
- foreground-background jobs
- electronic mail and printer spooling
- system accounting facilities

The support software currently available for use under UniFLEX™ is extensive.
Asampling of the programs available includes:

- native C compiler (full implementation)
- native Pascal compiler
- FORTRAN 77 ANSI Subset compiler
- COBOL compiler with ISAM files, Report Writer & Sort/Merge
- Extended BASIC interpreter
- Extended BASIC precompiler
- text editing and processing software
- enhanced printer spooler
- variety of absolute and relocatable assemblers
- debug and diagnostic packages

Technical Systems Consultants, Inc. also offers a line of single user FLEX™ software products for 6800 and 6809 processors. For those having an absolute need for a 16 bit processor, UniFLEX™ will be available through OEM licensing arrangements for the 68000 microprocessor. Please call or write for additional information on individual products or OEM licensing arrangements.

UNIX" is a trademark of Bell Laboratories. FLEX" and UniFLEX" are trademarks of Technical Systems Consultants, Inc.



111 Providence Road Chapel Hill, North Carolina 27514 (919) 493-1451 THIS IS WORD WRAP

SCALING

THIS IS NOT WO



#### Proportional Spacing

CHARACTER
T
H

CURSOR CONTROL

Figure 18: Some examples of the text and Mosaic features of NAPLPS.

compromise was not desired, but compromises such as this occur frequently when standards are being developed.

#### User Input

Because of the heavy emphasis on text and graphics in NAPLPS, the user-input features are often

overlooked. User input is needed to allow a terminal user to enter information that will eventually be sent to the central host computer. This input could be used to request information from a database, order products, schedule an airline reservation, or send electronic mail.

User input has been integrated with

the rest of NAPLPS in an elegant manner. Certain areas or fields of the unit screen can be designated as user-input areas. These areas are called *unprotected fields*.

The user can enter information into the unprotected fields using a variety of input devices such as keyboards, light pens, joysticks, graphics tablets, and even a "mouse." Information entered in the fields is stored as NAPLPS data. The user must eventually indicate (usually via a Send key) that all the information has been entered and should be sent to the host.

When the host computer receives the block of information, it may or may not decode it, depending on the application. For example, a graphics electronic-mail message would merely be sent to the appropriate addressee and would not have to be decoded.

The text of a message does not have to be entered on rigid lines as in most terminal systems. In applications such as electronic mail, a user who



#### A Complete Winchester/Floppy Disk System.

- Disk controller with 4 ports; supports wide range of drives; 5½ " and 8"drives can be on same cable.
- Z80 CPU includes 4MHz, 64KRAM, 2 serial I/O, 1 parallel, CTC.
- Supports 10MB streaming tape. CP/M® and BIOS included.
- Package price: \$1,195.00.

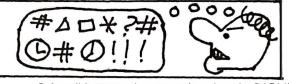
May be purchased separately. Disk and streaming drives available.

#### **SIGEN Corporation**

1800 Wyatt Dr., #6, Santa Clara, CA 95054 Contact: Allen Hauptman, **408/988-2527** CP/M is a trademark of Digital Research.



# BDOS ERROR ON B:BAD SECTOR



Before disk errors ruin your work again order BADLIM.

- BADLIM assures the reliability of your CP/M computer.
- You can use your disks 10 times longer without losing your data AND your time.
- BADLIM checks thoroughly your disk marking all the blocks which have defective sectors. The operating system will know that those sectors should be skipped.
- BADLIM is the only program that gives protection for soft and hard errors.
- The first time BADLIM will list which files in your disk are on bad sectors, so you can take action to correct it.
- But thereafter the bad areas in your disk will be automatically by-passed.
- For CP/M 1.4 single density and for CP/M 2.xx of any format and density. It is a must for Winchester as the media cannot be replaced.

BADLIM cost only \$73. Whatever the reason you have to use a computer you need BADLIM. Contact your dealer or call us today:

BLAT R&D Corp., 8016 188th. St SW, Edmonds WA 98020. Phone: [206] 771-1408 DEALER INQUIRIES INVITED. BADLIM

#### LEADER in MAIL ORDER DISCOUNTS! 800 433-5184

Texas 817/274-5625

#### **IBM Personal Computer**

INTERNAL DISKS FOR IBM Complete IBM Disk Systems ... \$CALL Tandon Internal Disk .. single sided 180k Tandon Internal Disk . double sided 320k

HARD DISKS FOR IBM Complete 5 mag. Systems . . . from \$1588 Multi-computer Network Systems available MONITORS FOR IBM

Green - hi resolution ...... from \$89
Matching PGS Color - super hi res . \$Call

QUADBOARD FOR IBM Includes 64k to 256k additional Memory, Serial & Parallel Port and Calendar Clock ..... each \$2

PRINTER FOR IBM

Epson, Star & other matrix printers . \$Call NEC 3550 Spinwriter IBM version . . \$Call

#### ATARI

ATARI 800 COMPUTER ATARI 810 DISK DRIVES Percom Double Density EXT. DRIVES ATARI 850 Interface and Cable Compatible PRINTERS and Cables

#### APPLE

| First DISK DRIVE w/controller, DOS 3.3, cables and manual \$419 |
|-----------------------------------------------------------------|
| Second DISK DRIVE with cable \$319                              |
| APPLE to EPSON card and cable                                   |

| 7 00 0                                |              |
|---------------------------------------|--------------|
| Z 80 Card                             | Call         |
| RAM Card                              | Call         |
| Printer Interface Cards               | <b>SCall</b> |
| Graphic Printer Interface Card        | \$139        |
| Graphic Spooler Interface Card/16k to |              |

#### TANDON DRIVES

TCS DRIVE CABINET is industrial grade heavy guage metal, safely fused, and comes with gold plated external connector with extender cable.

#### 1 DRIVE in Cabinet

| I DRIVE III CADIIICI            |       |
|---------------------------------|-------|
| 40 track single sided           | \$249 |
| 40 track single sided           | \$329 |
| 180 track (dual sided 80 track) | \$449 |
| 1 DRIVE /Double Cabi            |       |

| DRIVE/DOUBLE CADII             | •     |
|--------------------------------|-------|
| 40 track single sided          | \$289 |
| 80 track (dual sided 40 track) | \$366 |
|                                |       |

#### 2 DRIVES/Double Cabinet

| 40 track single sided                                                 |  |  | \$489 |
|-----------------------------------------------------------------------|--|--|-------|
| 80 track (dual sided 40 tracks) .<br>180 track (dual sided 80 tracks) |  |  | \$638 |
| 180 track (dual sided 80 tracks)                                      |  |  | \$849 |

Drives in cabinets come assembled/tested with power supply. Order cable separately.

#### **BARE DRIVES ONLY**

| 40 track single sided                                              | \$CALL |
|--------------------------------------------------------------------|--------|
| 80 track (dual sided 40 track) 180 track (dual sided 80 track)     | SCALL  |
| 8 Inch Slimline sgl/dbl sided<br>Winchester hard drives 5-30 meg . |        |

#### **CORVUS HARD DISK**

#### **CORVUS HARD DISKS**

Call for '83 prices - lowest anywhere

Add 5, 10 or 20 megabytes of storage to your TRS80, IBM, Apple, Atarl, Heath, Zenith, Intertec, S-100 and many others. One or several computers can share a hard disk. Get simultaneous access to data for multiple users. AVAILABLE NOW at SUPER SAVINGS.

#### **PRINTERS**

TCS has the LOWEST PRICES on IN STOCK PRINTERS!

#### **LETTER QUALITY PRINTERS**

STAR GEMINI Better than Epson and costs lessi 100 cps . . 180 day warranty Bit Image AND Block Graphics Friction Feed and Pin Feed paper STAR GEMINI 10 (10 Inch carriage) \$Call
STAR GEMINI 15 (15 inch carriage) \$Call
CJTOH 6510 / TEC / PMC \$Call
DMP 100 \$349
DMP 200 \$689
DMP 400 \$1029 DMP 500 ... \$1584 ANADEX 9501-A ... \$1395 CENTRONICS 352 / 353 ... \$Call

OKIDATA printers . . \$Call for Low Prices

#### **MATRIX PRINTERS**

| C.ITOH F-10 (40 cps)   | \$1595 |
|------------------------|--------|
| DAISY WHEEL II (RS)    | \$1695 |
| NEC 3510 / 3530 / 3550 | \$Call |
| NEC 7710 / 7730        | \$Call |
| SMITH CORONA TP-1      | \$849  |
| BROTHER / COMREX       | \$629  |
|                        |        |

#### **EPSON PRINTERS**

| EPSON MX 80 EPSON MX 80 FT EPSON MX 100 FT | \$CALL<br>\$CALL<br>\$CALL |
|--------------------------------------------|----------------------------|
| GRAPHTRAX PLUS come free in E              | PSONS                      |

Cables and Interfaces available for most popular computers

For fast, efficient service **Heart of** we can air freight from Dallas

#### TEXAS COMPUTER SYSTEMS

P.O. Box 1327 Arlington, Texas 76004-1327

**TEXAS ORDERS 817/274-5625** 

TECHNICAL ASSISTANCE 817/274-9221 ORDER STATUS 817/277-1913 TELEX/TWX/Easylink ELN 62100790



800 433-5184

No tax out of state. Texans add 5%. Prices subject to change at any time.

#### TCS MODEL III 48k 2 DISK



**\$1695** 

With standard 40 track double density drives. Over 340,000 bytes. Includes TDOS.

\$1995

With 2 dual headed 40 track dbl.density drives. Over 730,000 bytes. Includes DOSPLUS 3.4 (\$150 value)

Fully assembled and tested systems that are software compatible and functionally identical to Radio Shack units sold at computer stores for \$hundreds more.

- □ CONTROLLER BOARDS are high quality double sided epoxy boards with gold plated contacts
- POWER SUPPLY is the finest switching type available.
- MOUNTING HARDWARE includes power and data cables.
- □ DISK DRIVES are Tandon, the same ones used by Radio Shack ... 40 track, double density with a 5 millisecond stepping rate.

#### TCS MODEL III DISK EXPANSION KITS

| 1 Controller, Power Supply, Mounting Hardware & Instructions                 |      |
|------------------------------------------------------------------------------|------|
| 2 Controller, Power Supply, Hardware & one 40 track Tandon drive             | 577  |
| 3 Controller, Power Supply, Hardware, two 40 track Tandon drives. 32k memory |      |
| (everything you need for 2 drive 48k upgrade)                                | 799  |
| 3e Kit 3 but with two 60 track drives (dual sided 40s)                       | 1999 |
| 3b Kit 3 but with two 180 track drives (dual sided 80s)                      | 169  |

#### **MODEL III SYSTEMS**

Original 90 day manufacturer's warranty.

|              | \$598                  |
|--------------|------------------------|
|              | k\$Call                |
| MODEL III 48 | k\$Call                |
| MODEL III 48 | k 2 Drive RS232 \$Call |

#### COLOR COMPUTER

Original 90 day manufacturer's warranty

|   | ,                             |
|---|-------------------------------|
| ١ | COLOR COMPUTER 16k \$249      |
| 1 | COLOR COMPUTER 16k ext \$335  |
| 1 | COLOR COMPUTER 32k ext \$Call |
| 1 | COLOR COMPUTER DISK 0 \$479   |
| ١ | COLOR COMPUTER DISK 1 \$349   |
|   |                               |

TCS MODEL III Systems use original RS hardware and quality TCS memory.
180 day limited warranty.

| TCS MODEL<br>TCS MODEL<br>TCS MODEL | . 111 | 32k | <br> | <br>\$798 |
|-------------------------------------|-------|-----|------|-----------|
| _                                   |       |     |      |           |

Green or Amber Langley Sinclair CRT for your customized Model III ......\$Call

TCS COLOR COMPUTERS use original RS hardware & TCS memory. 180 day warranty.

| TCS COLOR COMPUTER 32k ext \$379 TCS COLOR COMPUTER DISK 0 \$449 |
|------------------------------------------------------------------|
| TCS COLOR COMPUTER DISK 1 \$249                                  |
| TCS 32k MEMORY \$79                                              |

#### Model II . . Model 16 . . Accessories . . \$CALI

TCS is an authorized TRS-80 dealer F701 in Brady, Texas

DEALER INQUIRIES invited on all TCS MODEL III Systems and Kits

#### **CUSTOM SOFTWARE FROM TCS**

BTREE Scratchpad BTREE Library \$39,95 \$39.95

**BTREE Mail List** \$49 95

#### THE PRODUCER TCS Exclusive \$149.95

The ultimate solution in creating your owncustom software. If you're in a jam and can't find a program to fit your needs, usethis fast and simple Program Development System to tallor make a solution to your problem. Custom deeign your own screen format with complete control over the number of characters assigned to each field. Fully view and edit all fields at all times. Create a B-Tree structured file allowing you to access data rapidly and without sorting. One key access to user-designed self-help or prompt information. Expand your program to support up to 8 calculations for each data field.

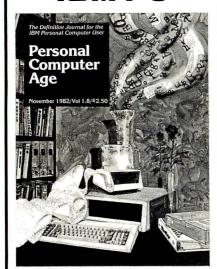
This system comes complete with its own Disk Operating System. It will make you a master of your software needs without hiring a programmer. Or if you are a programmer, this system will save you hundreds of hours in design work for your clients. Saving time is saving money! The ultimate solution in creating your owncustom software, if you're in a lam and can't

clients. Saving time is saving money!

WRITE FOR FREE BROCHURE ON TCS PROGRAM GENERATOR

# DISTINCTIVE for the

#### **IBM PC**



#### A Serious Monthly Magazine for the IBM PC User

Each issue is packed with in-depth hardware & software reviews, detailed how-to articles, reader tips, Q & A, special interest columns and much more...clearly written for either novice or computer veteran.

#### In Recent Issues:

- A Primer on Modems.
- •Legal Rights of Software Buyers.
- How to make your **BASIC programs** run faster.
- Word Processing from A-Z.
- BASIC v. Pascal: Which is for you?
- How to Program your Printer for maximum performance.
- Free Utility Programs

DON'T MISS ANOTHER EXCITING ISSUE— SUBSCRIBE NOW! 12 Colorful issues \$24.00

#### **CALL TOLL FREE:**

800-824-7888 operator 77 California only 800-852-7777 operator 77





WELCOME!

Or we'll bill you.

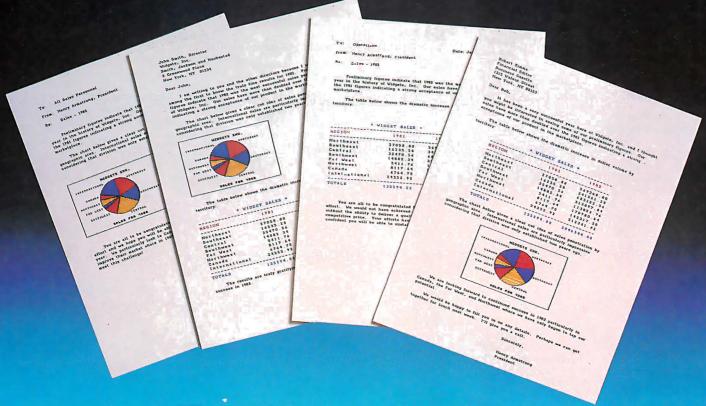
For more info & foreign rates, write:

#### Personal Computer Age

10057 Commerce Ave. Tujunga, CA 91042

|    |                |                |    | b6 |                                 |                                  | ,               | , | , |   |  |  |
|----|----------------|----------------|----|----|---------------------------------|----------------------------------|-----------------|---|---|---|--|--|
|    |                |                |    | 0  | 0                               | 1                                | 1               | ] | ; |   |  |  |
|    | b <sub>5</sub> |                | 0  | 1  |                                 | 0 0 1                            |                 | 1 |   |   |  |  |
|    |                |                |    |    |                                 |                                  |                 |   |   |   |  |  |
| b3 | b <sub>2</sub> | b <sub>1</sub> | ь0 |    | 2                               | 3                                | 4               | 5 | 6 | 7 |  |  |
| 0  | 0              | 0              | 0  | 0  | RESET                           | RECT<br>(OUT-<br>LINED)          |                 |   |   |   |  |  |
| 0  | 0              | 0              | 1  | T  | DOMAIN                          | RECT<br>(FILLED)                 |                 |   |   |   |  |  |
| 0  | 0              | 1              | 0  | 2  | TEXT                            | SET &<br>RECT<br>(OUT-<br>LINED) |                 |   |   |   |  |  |
| 0  | 0              | 1              | 1  | 3  | TEXTURE                         | SET & RECT (FILLED)              |                 |   |   |   |  |  |
| 0  | 1              | 0              | 0  | 4  | POINT<br>SET<br>(ABS)           | POLY<br>(OUT-<br>LINED)          |                 |   |   |   |  |  |
| 0. | 1              | 0              | 1  | 5  | POINT<br>SET<br>(REL)           | POLY<br>(FILLED)                 |                 |   |   |   |  |  |
| 0  | 1              | 1              | 0  | 6  | POINT<br>(ABS)                  | SET<br>POLY<br>(OUT-<br>LINED)   | NUMERIC<br>Data |   |   |   |  |  |
| 0  | 1              | 1              | 1  | 7  | POINT<br>(REL)                  | SET &<br>POLY<br>(FILLED)        |                 |   |   |   |  |  |
| 1  | 0              | 0              | 0  | 8  | LINE<br>(ABS)                   | FIELD                            |                 |   |   |   |  |  |
| 1  | 0              | 0              | 1  | 9  | LINE<br>(REL)                   | INCR<br>POINT                    |                 |   |   |   |  |  |
| 1  | o              | 1              | 0  | 10 | SET &<br>LINE<br>(ABS)          | INCR<br>LINE                     |                 |   |   |   |  |  |
| 1  | 0              | 1              | 1  | 11 | SET &<br>LINE<br>(REL)          | INCR<br>POLY<br>(FILLED)         |                 |   |   |   |  |  |
| 1  | 1              | 0              | 0  | 12 | ARC<br>(OUT-<br>LINED)          | SET<br>COLOR                     |                 |   |   |   |  |  |
| 1  | 1              | 0              | 1  | 13 | ARC<br>(FILLED)                 | WAIT                             |                 |   |   |   |  |  |
| 1  | 1              | 1              | 0  | 14 | SET &<br>ARC<br>(OUT-<br>LINED) | SÉLECT<br>COLOR                  |                 |   |   |   |  |  |
| 1  | 1              | 1              | 1  | 15 | SET &<br>ARC<br>(FILLED)        | BLINK                            |                 |   |   |   |  |  |

**Figure 19:** The operation codes (or op codes) of the Picture-Description Instruction (PDI) G-set. The four columns on the right (that is, bits 0 through 5) are used as data for various op codes.



#### Introducing ... The IS PipeLine™ Random Access Printing Buffer.

Insert pictures, graphics or spread-sheet data into reports. Duplicate form letters—automatically changing addresses on each. Now, all your programs can work together to produce printed output.

For the first time ever, here is a buffer that not only frees your fast computer from your slow printer but also allows you to rearrange, compose and copy your data on its way to the printer.

- Random Access Printing—stores paragraphs or pictures for printing in any order—any number of times.
- FIFO Printing—conventional first-in first-out operation.
   Compression of data for efficient utilization of memory space.
- Ability to interrupt long-term buffer operations for straight-thru shortterm printing.
- Simple Erase feature to clear buffer.
- Automatic duplication capability.
- Easily expandable, by you, from 8K Bytes to 128K Bytes.

The IS PipeLine is Universal—it works with any parallel (Centronics\* style) computer/printer combination. A special version is available for PKASO™ Printer Interfaces.

The IS PipeLine is a self-contained unit with operating manual, cables and power supply included.

For more information on the truly revolutionary IS PipeLine Random Access Printing Buffer, call us today.





Interactive Structures Inc. 146 Montgomery Avenue Bala Cynwyd, PA 19004 Telephone: (215) 667-1713

\*Centronics is a trademark of Centronics Data Computer Corp

Circle 213 on inquiry card. The IS Pipeline<sup>TM</sup> Random Access Printing Buffer is patent pending.

A NEW CONCEPT IN STATIC CONTROL

# YOU'LL NEVER A"NAKED"

A "naked" computer is any computer that sits on a bare table or desk top, without a *TouchMat*" static dissipative table mat directly under it.

"NAKED" COMPUTERS ARE VULNERABLE to some of the most frustrating static-related problems a computer user can encounter — erratic or erroneous data transmission, loss of programs or data, damage to discs or accessory cards, component failure, or "unexplained" down time.

During the dry winter heating season, you are probably more aware of static electricity because you can feel it. However, your computer is vulnerable to a much smaller ZAP than you can possibly feel, and that level of static may occur at any time of the year. Even air conditioning can aggravate the problem by drying the air.

IT ONLY TAKES ONE ZAP to make your perfectly logical computer act irrational and temperamental. Experienced computer users know that static electricity cannot be completely eliminated from the environment or the microcomputer, since people are prime generators of static. The best solution is to channel static charges harmlessly away before they have a chance to spark to sensitive components and accessories.

Discharging to a metal object, however, may provide a false sense of security, as static charges are easily built up again as a person moves around at the computer. Also, metal may create a potentially hazardos or annoying "hard spark." (You know...ZAP...OUCH!)

THE TOUCHMAT SITS ON THE TABLE, directly under the computer, within easy reach of your hands and fingers. To discharge static from your body, simply touch mat before turning on computer, and then periodically during operation.

Discharging takes less than a second, does not produce a spark, and is absolutely assured by the simple fact that your skin contacts the mat directly. (The sweat layer of the human skin is a primary conductor of electricity.) Anytime your hands or wrists rest on the mat, static discharge is automatic.

# TouchMat<sup>™</sup> INSTEAD.



The louchMat is made of a highly-engineered, 3-layer vinyl material that "pulls' static off your body without hard sparking, and then dissipates it through the mat at the optimum rate, draining it safely to ground via a grounding cord. The static dissipation rates of the material have been extensively tested and field-proven during years of use in critical static control applications for military/electronics manufacturing. (Remember, the "chips" inside your computer were even more sensitive to static during manufacture.)

# TOUCH COMPUTER AGAIN!

#### A DRAMATIC IMPROVEMENT OVER **CONDUCTIVE FLOOR MATS, the TouchMat does** not require users to wear leather-soled shoes for effective static discharge. A floor mat may be

rendered virtually ineffective by today's popular synthetic and rubber-soled shoes, which insulate

#### THE BEST THING NEXT TO YOUR

COMPUTER, the cushioning material of the TouchMat also serves to dampen noise and vibration, and prevents your computer from sliding around on the desktop. Available in a computercompatible beige, 24" x 26", it accommodates all popular micros.

IF YOU'RE UNCOMFORTABLE NOW, ABOUT YOUR "NAKED" COMPUTER — you should be. Static problems cost you time and money. Prudent computer users in offices, homes and schools everywhere are protecting their computer investment with a TouchMat.

#### **PUT STATIC CONTROL AT YOUR FINGERTIPS!**

Save \$10 off the suggested retail price of \$89. Take this coupon to your computer store or office supply dealer and ask for the TouchMat by name. For the name of your nearest TouchMat dealer, call

1-800-328-0223 outside Minnesota only. (Minnesota residents call collect (612) 430-2062. Twin Cities area dia! direct.)

If not yet available in your area, you may order direct for a limited time only. Allow 4-6 weeks for delivery. Visa and MasterCard accepted. Shipping and handling charges extra.





Dealer inquiries welcome.

louchMat

#### SPECIAL INTRODUCTORY OFFER

#### Save \$10 on the TouchMat!

To the retailer: Computerware Inc. will reimburse you for the face-value of this coupon plus 20¢ for handling if you receive it on the sale of the specified product and if upon request you submit evidence of purchase of sufficient stock to cover coupons presented. Coupon may not be assigned, transferred or reproduced. Customer must pay any sales tax. Void where prohibited, taxed, or restricted by law. Good only in U.S.A. Coupon will not be honored if presented through outside agencies, brokers or others who are not retail distributors of our merchandise or specifically authorized by us to present coupons for re-demption. Mail to: Computerware Inc., 315 South Third Street, Stillwater, MN 55082, 800-328-0223\*. (612) 430-2060 Minnesota.

This coupon good only on purchase of product indicated. Any other use constitutes fraud and may void all other coupons submitted for redemption.

LIMIT - ONE COUPON PER MAT.

Offer expires March 31, 1983.

StoreCoupon B654321

TouchMat is a trademark of, and is manufactured exclusively by: Computerware Inc. 315 South Third Street Stillwater, Minnesota 55082 (612) 430-2060 Circle 113 on Inquiry card.

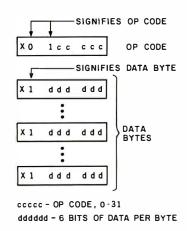
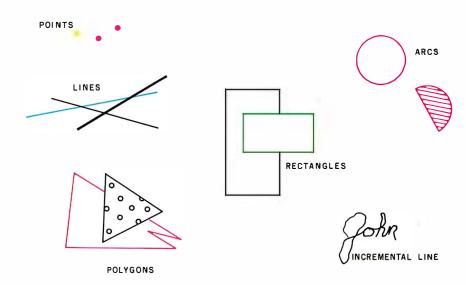


Figure 20: In the PDI G-set of NAPLPS, op codes are distinguished from data bytes by bit 6. If bit 6 is 0, the byte is an op code; otherwise, it is a data byte.

has the appropriate input device can even send *handwritten* messages using NAPLPS as the encoding mechanism.

The best analogy to describe user input in NAPLPS is to imagine that the user is handed one or more blank sheets of paper. (When the three-



**Figure 21:** Some examples of pictures that can be created with NAPLPS instructions. Approximately 180 bytes would be used to encode the entire figure. The signature alone requires 51 bytes.

dimensional mode is supported, the user will be given an empty box.) The user is able to type on the paper, draw a sketch on the paper, or do anything that his or her terminal allows.

The "paper" is eventually passed to a host computer, where it can be for-

warded to another user (electronic mail), stored for later recall, or analyzed by the host. The analysis by the host can be minimal or extensive, again depending on the application.

At this point, remember that NAPLPS is only a sixth-level specification in a seven-level model.

# Get the best of your first micro.

There's an easier way.

It's called dBASE II,™ a relational database management system that uses powerful, English-like commands.

With a word or two, you *create* databases, *append* new data, *update*, *modify* and *replace* fields, records and entire databases. *Display* any information, *report* months worth of data in minutes and *zip* through input screens and output forms.

You can use it interactively and get your answers right now. Or save your instructions and repeat everything with two words: *do Manhours, do Project X, do* whatever has to be done.

It's being used for accounting, project management and hundreds of other applications.

To try dBASE II free for 30 days, drop by your local computer store. Or if they're sold out, call us at (213) 204-5570. If you don't like it, you get your money back.

But we think you'll keep it. Because having dBASE II is like having a black belt in micros.



## Ashton-Tate

© 1982 Ashton-Tate CP/M is a trademark of Digital Research

## Deciding Which Computer to Buy

Of the 1.9 million people who bought small computers last year, over 20,000 of them bought the wrong computer for their needs. And no wonder. New products are introduced into the market at a breathtaking pace. The language question. The terminology problem -RAMs, ROMs, bits, bytes, bauds, protocols and processors. What's important? What's standard and what's optional? Even the dealers are confused

To help you tackle this problem, we pulled together many of our sources -including leading experts in the field, manufacturers, marketing analysts, computer dealers and customers. In addition, we utilized computer user groups, clubs and associations throughout the United States, contacts in Japan and numerous industry and business publications. COMPUTER GUIDE 1983 is the natural result of learning from the knowledge and mistakes of more than one million people.

The following steps will help you with your computer shopping -whether you're buying your first computer, or updating the one you have. COMPUTER GUIDE 1983 can help you make the right decision.

### 1. What is the computer to be used for?

You may want to use it for entertainment, financial planning, learning how to speak a foreign language, office work, drawing and many other tasks a computer does well. The possible uses of a computer ore as varied as human activities.

### 2. Which program will do the best job?

There are thousands of application programs on the market to consider. It is the program that gives you the power to control the actions of the computer. You must choose the right application program.

The first section of COMPUTER GUIDE 1983 surveys each of the application programs available with computers today. Similar programs are grouped together and compared -one against another. COMPUTER GUIDE 1983 contains over 2,000 application programs, grouped in over 100 categories -including programs for accounting, management, professional uses, word processing, graphics, research, games, learning and special applications. Programs are described using comparison charts -listing for each application program: the program name, computer(s) and system configuration(s) required, the documentation available and the price.

COMPUTER GUIDE 1983 provides you with a quick and efficient way of deciding which application program and which computer and options for that computer can do the right job for you.

## 3. The language?

You cannot get a computer to do anything useful unless you know how to talk to it. This is no easy task. But, COMPUTER GUIDE 1983 can help.

The second section of COMPUTER GUIDE 1983 guides you in selecting the right language. Different dialects of languages are grouped in their generic category. The BASIC language, for example, is a generic name and has many dialects -including Microsoft Basic, Atari Basic, Basic Plus and Basic-80.

COMPUTER GUIDE and CESS are trademarks of Computer & Electronic Supply Services, P.O. Box 345, MIT Branch P.O. Cambridge, MA 02139.

Each of these languages have their own machine requirements. COMPUTER GUIDE 1983 provides the nome, machine and machine requirements, documentation and price of over 500 dialects, for over 50 languages. COMPUTER GUIDE 1983 helps you solve the language problem.

## 4. What about the machine?

Depending on your needs, there will probably be several computers still in the running. Now the decision is based on the guts of the machines (hardware). **COMPUTER GUIDE 1983** compares machine characteristics in an easy to follow format. You don't have to be an electrical engineer to make an intelligent decision.

The solution is to work top down and not to go any further down than is needed. Your uses for the computer determines which machine characteristics ore important. COMPUTER GUIDE 1983 divides the machine into five areas -the keyboard, video display, printer, other peripherals and I/O, processor and memory and direct access storage. These five areas correspond to your basic machine needs. For example, an accountant needs a keyboard with a numeric keypad; word processing requires a printer; games utilize a video display; a mathematician wants o very fast machine; lots of memory is best when using the LISP language; and so on, as the hardware combines with the application program to develop a complete computer system.

COMPUTER GUIDE 1983 contains machine descriptions for over 250 computer systems, produced by over 150 manufacturers. Information is displayed in spreadsheets -allowing you to get the information you need. You don't have to bother with extraneous details and cumbersome text. COMPUTER GUIDE 1983 can accommodate millions of people in making the right decision, as varied as those decisions will be.

## 5. Where to buy the chosen computer system.

COMPUTER GUIDE 1983 lists hundreds of vendors, by geographical location, and by the products they sell. It also provides additional consumer information. The first ship date, the ship rate, the number installed to date, prices and what that includes, purchasing terms and warranties. COMPUTER GUIDE 1983 contains the names, addresses and phone numbers of hundreds of manufacturers, dealers and stores throughout the United States.

No one wins when you buy the wrong computer or computer product. Make the right decision. Use COMPUTER GUIDE 1983.

| Send me      | COMPUTER GUIDE 1983     |
|--------------|-------------------------|
| The complete | computer buyer's guide. |

I'm enclosing my check for \$32.75 plus \$1.50 for shipping. (Mass. residents add 5% sales tax.)

Mail to: CESS

P.O. Box 345, MIT Branch P.O. Cambridge, MA 02139 (617) 491-8925

Name Address\_ City, State and Zip\_\_\_\_

Please allow six to eight weeks for delivery.

|    |                |            |     | b7 | 0           | 0               |   |                |    |            |    | b7  | 1               | 1                        |
|----|----------------|------------|-----|----|-------------|-----------------|---|----------------|----|------------|----|-----|-----------------|--------------------------|
|    |                |            |     | b6 | 0           | 0               |   |                |    |            |    | b6  | 0               | 0                        |
|    |                |            |     | b5 | ō           | 0               |   |                |    |            |    | b5  | 0               | Ö                        |
|    |                |            |     | b4 | 0           | 1               |   |                |    |            |    | b4  | 0               | 1                        |
| b3 | b <sub>2</sub> | <b>b</b> 1 | ь0  |    | 0           | 1               |   | b <sub>3</sub> | b2 | <b>b</b> 1 | ьо |     | 8               | 9                        |
| 0  | 0              | 0          | 0   | 0  | NUL         | DLE             |   | o              | 0  | 0          | 0  | 0   | DEF<br>MACRO    | PROTECT                  |
| 0  | 0              | 0          | 1   | I, | ѕон         | DC <sub>1</sub> |   | 0              | 0. | 0          | ï  | 1   | DEFP<br>MACRO   | EDC <sub>1</sub>         |
| 0  | 0              | 1          | 0   | 2  | STX         | DC <sub>2</sub> |   | 0              | 0  | 1          | 0  | 2   | DEFT<br>MACRO   | EDC <sub>2</sub>         |
| 0  | 0              | 1          | 1   | 3  | ETX         | DC3             |   | 0              | 0  | 1          | 1  | 3   | DEF             | EDC3                     |
| 0  | 1              | 0          | 0   | 4  | ЕОТ         | DC <sub>4</sub> |   | 0              | 1  | 0          | 0  | 4   | DE F<br>TEXTUR  | EDC4                     |
| 0  | 1              | 0          | 1   | 5  | ENQ         | NAK             |   | 0              | 1  | 0          | 1  | 5   | END             | WORD<br>WRAP<br>ON       |
| 0  | 1              | 1          | 0   | 6  | ACK         | SYN             |   | 0              | 1  | 1          | 0  | 6   | REPEAT          | WORD<br>WRAP<br>OFF      |
| 0  | 1              | 1,         | 1   | 7  | BEL         | ЕТВ             |   | o              | 1  | 1          | 1  | 7   | REPEA<br>TO EO  | SCROLL<br>ON             |
| 1  | Ö              | 0          | 0 · | 8  | APB<br>(BS) | CAN             |   | 1              | 0  | 0          | 0  | 8   | REVERS<br>VIDEO | S SCROLL<br>OFF          |
| 1  | 0              | 0          | 1   | 9  | APF<br>(HT) | SS2             |   | 1              | 0  | 0          | 1  | 9   | NORMA<br>VIDEO  | L UNDER<br>LINE<br>START |
| 1  | 0              | 1          | 0   | 10 | APD<br>(LF) | SUB             | ١ | 1              | 0  | 1          | 0  | 10  | SMALL<br>TEXT   | UNDER<br>LINE<br>STOP    |
| 1  | 0              | 1          | 1   | П  | APU<br>(VT) | ESC             | ١ | 1              | 0  | 1          | 1  | П   | MED<br>TEXT     | FLASH<br>CURSOR          |
| 1  | 1              | 0          | 0   | 12 | CS<br>(FF)  | APS             | ۱ | 1              | 1  | 0 .        | 0  | 12  | NORMA<br>TEXT   | L STEADY<br>CURSOR       |
| 1  | 1              | 0          | 1   | 13 | APR<br>(CR) | SS3             |   | 1              | 1  | 0          | 1  | 13  | DOUBL<br>HEIGHT |                          |
| 1  | 1              | 1          | 0   | 14 | so          | АРН             |   | 1              | 1  | 1          | 0  | 14  | BLINK           |                          |
| 1  | 1              | 1          | 1   | 15 | SI          | NSR             |   | 1              | 1  | 1          | 1  | √15 | DOUBLI          | UNPRO-<br>TECT           |

Figure 22: The two control sets used in NAPLPS.

NAPLPS merely provides a vehicle for the seventh level (commonly called the application level) that comprises the application programs and software (e.g., a banking program) that will run on NAPLPS. Many special applications can be developed and standardized at level 7 using NAPLPS as a foundation. These applications may be very specialized

and might use only a subset of NAPLPS.

When we discuss user input, it should be noted that NAPLPS was not developed as a standard to be used for massive amounts of data entry in large data-processing centers. NAPLPS was developed to be used by people at home, at work, and at play. It was designed to be elegant and free-form.

NAPLPS was designed in this manner based on the assumption that most people do not want to interact with computers in robot-like ways. People will enter data by looking at menus and pointing to selections, rather than learning some complex command syntax. As we mentioned earlier, with a graphics tablet or other digitizer, people will even be able to input handwritten messages. Studies have shown that people want as much of their personality as possible to be reflected in their communication. And they expect that if they enter something reasonable, that it should be accepted and handled in a reasonable manner.

### Macros

Macros (or macroinstructions) are specified in NAPLPS to reduce the amount of data that must be transmitted from the host to the terminal. Macros provide a mechanism whereby a frequently used multibyte string of text and/or graphics can be represented by a single-character macro. If the name of that macro appears later in the incoming data stream, the terminal retrieves the multibyte string and inserts it into the incoming stream in place of the macro name.

Once the string has been inserted into the incoming stream, the terminal processes it as if it had come from the host. Also, nesting of macros is allowed so that one macro can be used to retrieve several other macros. Of course, you must be careful to avoid looping and recursive macros that will endlessly refer to each other.

Ninety-six macro names are available. NAPLPS allows a unique, variable-length string to be stored for each name. Also, macros can be used in two directions: from the host to the

# SALES COMPANY

## SAVE ON ... COMPUTERS · MONITORS PRINTERS · PERIPHERALS · SUPPLIES\*



## **Amdek Color I Monitor**

Our Lowest Price Ever!

\$ 315 OMEGA PRICE

Manufacturers
Suggested
Retail Price 449.00

## **IDS 480 Microprism**

NEW "Maisey" Print Quality

\$549 PRICE

Manufacturers Suggested Retail Price 699.00

## **OMEGA SALE PRICED PRINTERS**

| 1,259.00 | DIABLO 620                     |
|----------|--------------------------------|
| 1,559.00 | IDS PRISM 132 (COLOR) w/ACCESS |
| 459.00   | C-ITOH PROWRITER 8510 AP       |
| 1,499.00 | NEC 3510 SPINWRITER            |
| 1,995.00 | NEC 3550 (IBM)                 |
| 679.00   | OKIDATA MICROLINE 83A PRINTER  |

## MODEMS ON SALE THIS MONTH

| HAYES MICROMODEM II (APPLE II) | 289.00 |
|--------------------------------|--------|
| HAYES SMARTMODEM 300 baud      | 230.00 |
| SIGNALMAN MODEM (ATARI 850)    | 85.00  |
| SIGNALMAN MODEM (IRM PC)       | 159.00 |

## MONITOR BARGAINS FROM OMEGA

| 139.00 | AMDEK VIDEO 300 MONITOR          |
|--------|----------------------------------|
| 399.00 | AMDEK COLOR III-RGB MONITOR      |
| 649.00 | ELECTROHOME 13" RGB HIGH RES     |
| 169.00 | NEC JB1201M(A) 12" GREEN MONITOR |
| 159.00 | USI P-2 12" GREEN MONITOR        |
| 175.00 | USI P-3 12" AMBER MONITOR        |

## **BIG SAVINGS ON ACCESSORIES**

| MICROSOFT SOFTCARD PREMIUM SYSTEM. | 579.00 |
|------------------------------------|--------|
| MICROSOFT 64K RAMCARD for IBM      | 269.00 |
| ORANGE MICRO GRAPPLER +            | 120.00 |
| RANA FLITE Lw/ CONTROLLER          | 439.00 |

## UNADVERTISED SPECIALS ON • COMREX • EPSON • ALTOS • SMITH CORONA

• All Equipment Factory Fresh w/ MFT Warranty

• Prices Do Not Include Shipping Charges

• Mass. Residents Add 5% Sales Tax

## **ACCESSORIES & SUPPLIES**

OMEGA Has A Complete Line of Accessories & Supplies for the Apple II and many other Popular Computers by manufacturers like:

- D.C. Hyes Microsoft Tymac
- M & R Enterprises Mountain Computers
- Kensington Microware Practical Peripherals
- T.G. Products Videx

## **SOFTWARE**

Omega Caries Software by the following companies:

- American Business Systems Ashton Tate
- Dakin 5 Innovative Software Microsoft
- Sorcim Stoneware Visicorp

## CUSTOMER PICKUP NOW AVAILABLE

At Our NEW Location... 334 R Cambridge St., Burlington, Mass. (617) 229-6464



WELCOME AT NO
EXTRA CHARGE

\* PRICES, SPECIFICATIONS AND AVAILABILITY OF ADVERTISED MERCHANDISE SUBJECT TO CHANGE WITHOUT NOTICE

## MAGNETIC MEDIA

OMEGA Stocks Diskettes by:

• Dysan • Elephant • Maxell • Verbatim

## **OMEGA SALES COMPANY**

334 R CAMBRIDGE STREET, BURLINGTON, MA. 01803

253

## **Everybody's** Logic Analyzer



A logic probe and oscilloscope are no longer adequate for analysis in today's digital world. For testing or debugging microcomputer or other digital logic circuits you need a real logic analyzer.

The LA-12 captures, stores and displays TTL and LSTTL digital data so that the instantaneous meaning of the data stream (e.g. data value, ASCII code, address) can be understood and analyzed long after the actual events have passed.

- Easy to Use 10 MHz Clock Qualifier ■ Trigger input ■ 3 Trigger Qualifiers 
  Built-in LED Display -No oscilloscope needed ■ Compact
- Expandable Low Cost

### 30 day trial

Purchase an LA-12, use it, and if you are not completely satisfied, return it within 30 days and receive a full refund.

### Free Offer

If you order within 45 days, and mention this magazine, you will receive a \$49.95 input cable free with each LA-12 ordered.

## Save \$28.95

In addition, if you enclose payment with your order you can deduct 5% and we will pay shipping charges.

All prices are in US dollars for 120VAC.

To order in the Continental US call

## **TOLL FREE** 1-(800) 228-6505

Connecticut microComputer, Inc. 36 Del Mar Drive, Brookfield, CT 06804 (203) 775-4595 TWX: 710-456-0052

| Description                | Price ·                                                                                           | Total                                                                                                                                       |
|----------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Logic Analyzer             | \$379.00                                                                                          |                                                                                                                                             |
| Input Cable                | 49.95                                                                                             |                                                                                                                                             |
| 20 Color-coded microclips  | 44.95                                                                                             |                                                                                                                                             |
| ecticut residents add 71/2 | % sales tax                                                                                       |                                                                                                                                             |
| Shipping &<br>Handling     | \$10.00                                                                                           |                                                                                                                                             |
| Total                      |                                                                                                   |                                                                                                                                             |
|                            | Logic Analyzer Input Cable 20 Color-coded microclips ecticut residents add 7½ Shipping & Handling | Logic Analyzer \$379.00 Input Cable 49.95 20 Color-coded microclips 44.95 ecticut residents add 71/4% sales tax Shipping & Handling \$10.00 |

| 1               | otai       |                 |
|-----------------|------------|-----------------|
| Eirme only      |            | enclosed (Rated |
| ☐ Check         | □ VISA     | ☐ MasterCard    |
| Acct. No        |            |                 |
| Signature       |            | Exp. Date       |
| Name (Print)    |            |                 |
| Address         |            |                 |
| City            |            |                 |
| State           |            | Zip             |
| Dealer inquirie | es invited |                 |

NAPIPS CODE

MACRO 26

DEFINE MACRO 26 SELECT BLUE CLEAR SCREEN SELECT WHITE POSITION (.05, .25) TEXT "READY:



Figure 23: An example of the use of macros in NAPLPS. Each time the code for Macro 26 occurs in the data stream, the word "READY:" will appear on a blank screen.

terminal and vice versa. The direction can be specified when the macro is defined. The typical direction is to expand the macro into the terminal as described above. In the so-called transmit macros, the expansion of the macro occurs toward the host.

Transmit macros are usually associated with programmable function keys on the terminal. When a key is pressed, the string associated with the macro and the key is sent to the host.

Figure 23 illustrates a typical application of macros. Here, a macro has been defined. In this case, it was given the number 26. Later in the stream of NAPLPS instructions, the macro name 26 appears and the macro is expanded and processed by the terminal. The screen will be cleared to blue, the color white will be selected, and the word "READY:" will appear one-fourth of the way up the screen and a little in from the left edge. (Note that on the display screen the word "READY:" may appear to be one-third of the way up from the bottom; this results from the fact that the top quarter of the unit screen is not displayed.) Only 1 byte was sent to invoke this multibyte sequence. With this type of compression, a system can be made to appear very fast, even over 300-bit-per-second data links.

## The Future of NAPLPS

NAPLPS has finally started to emerge as the most extensive text and graphics standard in existence. Many companies have hundreds of people working on NAPLPS-related projects. A survey in Data Communications magazine predicted that NAPLPS will be one of the most significant achievements in information exchange in the latter half of this cen-

Part of the reason for this popularity is the fact that NAPLPS is not only a video-graphics protocol but an information-exchange language. NAPLPS has been used to encode pictures for plotters, printers, laser printers, and phototypesetters. NAPLPS can be used to encode precise descriptions of logos, trademarks, and physical objects, things which heretofore have been very difficult to describe precisely.

NAPLPS comes at a time when the information industry is bursting with new technology that exceeds existing standards for information interchange. NAPLPS is a standard that pushes this new technology to its limits and still provides the capability to accommodate unknown expan-

NAPLPS is only the tip of the iceberg. In subsequent parts of this series, we will describe how NAPLPS fits into the larger scheme of local and regional area networks and distributed intelligent-terminal systems. Topics such as down-loading, file transfer, and operating-system evolution and compatibility will be covered.

Next month, we will begin to describe in detail how to write and decode NAPLPS information. In the meantime, anyone interested in obtaining more information about NAPLPS should obtain a copy of the ANSI standard specification. ■

## **Hard Disk is Easy** to Control



## With Advanced Digital's Error Correcting Controller!

Advanced Digital has solved the problem of hard disk control with the HDC-1001, a unique, error-correcting, microprocessor-based hard disk controller board for S-100 based computers. Now, control of up to four 51/4" or four 8" Winchester drives is a snap.

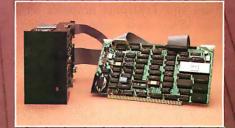
Occupying only one slot in the S-100 chassis, the HDC-1001's unique error-correcting capabilities will detect and correct errors before you're even aware of them. In addition, you get up to 8-Bit single burst correction, multiple burst detection, programmable correction/detection span, and much, much more.

- Up to 5 MBits/sec data rates
- 256 sector addressing range
- CRC generation/verification on ID fields
- ECC generation/correction on data fields
- Automatic retries on all errors
- Automatic restore and reseek on seek error
- 32 Bit computer generated polynomical
- Complete documentation
- One year warranty
- Retail price: \$500

nd now Advanced Digital has really made it easy to add hard disk capabilities by offering you a perfectly matched, thoroughly-tested disk subsystem. The subsystem combines the HDC-1001 controller with an industry-standard 5 MByte hard disk and comes complete with cable and CP/M BIOS disk. With a suggested retail price of \$1800 (an optional 20 MByte drive is available for only \$200 more), Advanced Digital is by far your most cost effective way to gain control of a hard disk.



Ask about our full line of S-100 products, including our SUPER QUAD® single board computer, SUPER SLAVE® processor boards and SUPER SYSTEM® multi-user, multiprocessor computer. Write or call Sales Department



12700-B Knott Street ● Garden Grove, California 92641 ● (714) 891-4004 TELEX 678401 tab irin

# Realizing Graphics Standards for Microcomputers

Use of the Virtual Device Interface graphics system will make portable graphics application software possible.

Fred E. Langhorst Digital Research Inc. POB 579 Pacific Grove, CA 93950

Thomas B. Clarkson III Graphic Software Systems Inc. POB 673 Wilsonville, OR 97070

Emerging standards for interactive computer graphics herald an era in which serious graphics applications will be as ubiquitous as spreadsheet and word-processing programs. By promoting program portability, making it possible to run the same programs on different computer systems, standards will create large markets for both software and hardware graphics products. As a result, the development of sophisticated graphics applications for microcomputers will be economically feasible. The benefit for the end user will be more software offerings of higher quality at reduced cost.

## A History of Graphics Standards

The earliest graphics standards were de facto standards created by a small number of manufacturers who established dominance in the field by producing various successful graphics output devices, such as Calcomp plotters and Tektronix graphics terminals. When these companies added software support (for example, Tektronix's Plot-10 package), their implementation of graphics-device-control routines became the common graphics language for applications. This situation lasted until the early 1970s, when the need for broader and

more flexible standards was recognized.

In 1974, the Special Interest Group on Computer Graphics (SIGGRAPH) of the Association for Computing Machinery (ACM) held the Workshop on Machine Independent Graphics at the National Bureau of Standards near Washington. This conference marked the beginning of formal efforts in the United States to standardize graphics. The goal: to define a generic method for describing pictures that could be output to a variety of graphics devices such as hard-copy plotters and vector or raster video displays.

The International Workshop on Graphics Standards Methodology held in 1976 in Seillac, France, accelerated the work begun by SIG-GRAPH. A significant development was the decision to break the standardization task into two components: first, to develop methods for making applications programs portable, and second, to develop a functional description of a "core" or basic graphics system.

In 1977, the Graphic Standards Planning Committee released its first draft of a graphics standard, the SIG-GRAPH Core Standard. This draft incorporated input and output capabilities for a range of graphics devices but did not address the emerging field of raster graphics. Then, after two more years of work, the committee released a major publication, the Status Report of the Graphic Standards Planning Committee, at the annual SIGGRAPH conference in 1979. Included was a methodology and specification for the Core Graphics System, rastergraphics extensions to the Core System, a description of Metafile (a device-independent picture file) and a model for distributed graphics systems. This document also provided the impetus for the formation of the ANSI (American National Standards Institute) Technical Committee X3H3 for Computer Graphics Programming Languages. Formed in 1979, this ANSI group is now the major graphics-standardization body in the United States. Meanwhile in Europe, the Deutsches Institut fur Normung (DIN), the German standardization institute, was working on a parallel effort to produce its Graphical Kernel System (GKS).

## **Current Standards Efforts**

Present efforts in standardization focus on two main interface levels: the programmer interface and the

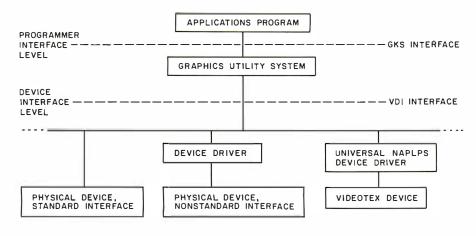


Figure 1: The two main levels of graphics standardization are the programmer and device-interface levels. The Graphical Kernel System (GKS) provides a standard interface between the application program and graphics utility programs. The Virtual Device Interface (VDI) standardizes the interface between graphics utilities and device drivers.

device interface. The programmer interface refers to the conceptual model as well as the syntax the programmer uses when incorporating graphics functions into an application program. The device interface refers to the protocol used for communication between the device-independent and the device-dependent functions (sometimes called the DI/DD interface). The programmer interface standardizes the calling sequence and functions of a graphics-procedure library, while the device interface defines a device-driver protocol that is consistent for all graphics devices (see figure 1).

## The Graphical Kernel System

The Graphical Kernel System (GKS) is the principal emerging standard at the programmer level. GKS has felt the influence of many national organizations, including ANSI in the United States, and is justifiably described as an international standard. Now a Draft International Standard, the GKS specification is frozen awaiting final adoption as an ISO (International Organization for Standardization) standard.

GKS allows portability of graphics application programs between different computer installations by providing a consistent interface in highlevel languages such as FORTRAN and Pascal. It also improves a programmer's ability to work on dif-

ferent systems by providing a graphics model and syntax that are common to several systems. This is accomplished by standardizing the way in which graphics functions are accessed and by providing graphics output on a virtual device surface defined in normalized device coordinates. The application program may then control the way individual workstations interpret the normalized coordinates, which are translated to real-device coordinates for display, although the other layers of the system are fooled into thinking they are communicating with the idealized virtual device.

Reflecting the rigors of its origin in the flexibility it provides, GKS supports a full set of drawing primitive commands (with variable attributes) for data input and drawing, support for multiple workstations, and device-independent picture segments. It also supports raster graphics through a comprehensive set of areafill and pixel-array primitives. While GKS provides device independence for standard functions, nonstandard operations are also made available through the Generalized Drawing Primitive, a well-defined mechanism to escape from GKS that allows a programmer to access the unique capabilities of a particular device.

Let's take a look at some parts of the GKS specification.

GKS Workstations: A GKS work-

station is a single display surface and one or more input devices. The display surface is usually a cathode-raytube screen, although it could be a plotter bed or some other device. Multiple workstations that may operate in a single, interactive graphics session might include, for example, a raster display, a plotter, and a storage display tube. GKS provides the logical interface through which the application program controls physical devices, allowing the application to redirect the flow of graphics data to another I/O device at any time.

GKS Graphics Primitives: The basic drawing primitives in GKS are the polyline, polymarker, and text primitives. The polyline primitive draws a sequence of vectors (straight lines) between pairs of points that form a sequence specified as an array (sort of a "connect the dots" command). A single line is merely a special case of the polyline, defined by specifying both endpoints (rather than relying on a sometimes ambiguous and confusing current-position model). The polymarker primitive, chiefly used to identify points on plotted curves, is similar to the polyline except that a marker symbol, rather than a vector, is drawn at each specified point. The text primitive allows text strings to be displayed at any position with any orientation.

GKS also supports raster devices with fill and pixel-array primitives. The *fill* operation paints the interior of a closed polyline (polygon) with a specified color or pattern (such as a crosshatch). The *pixel-array* primitive allows a two-dimensional array of pixels of different colors, called a *cell*, to be defined. The cell may then be replicated over an arbitrary area simply by giving the desired boundaries. This operation finds many uses in imaging applications such as videoframe displays, cartography, and other scientific areas.

Some graphics-output devices have incorporated unusually powerful capabilities into their repertoire, such as the ability to draw arcs, circles, and bars. GKS allows an application program to access these capabilities through a special escape mechanism

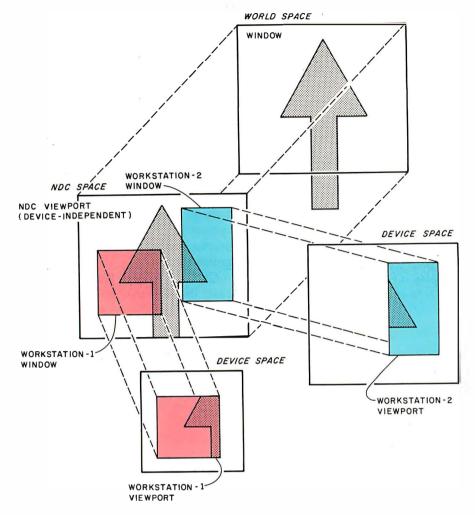


Figure 2: GKS provides a versatile set of viewing transformations. A window may be defined in the application's conceptual "world space," which selects a portion of that space to be viewed. The window is mapped to an area or viewport in an intermediate virtual space called the normalized-device-coordinate (NDC) space. This space appears identical to all devices in the system. Each workstation can then define its own window into the NDC space; each workstation window is mapped to its own viewport on the device display surface. This transformation allows each workstation to have a separate view of the NDC space.

called the Generalized Drawing Primitive. By passing an identification number and the required parameters to the driver, any unique feature of the device may be invoked. In effect, the Generalized Drawing Primitive is a standard way to be nonstandard.

Attributes: Associated with each output primitive are attributes that alter the object's appearance. For example, the polyline primitive has linetype (solid, dashed, etc.), width, and color attributes. Polymarkers have attributes of style, size, and color; the styles comprise a choice of common ASCII (American Standard Code for Information Interchange) characters. Text primitives have attributes of

size, color and orientation; and multiple character fonts can be accessed if they are available in the graphics device. Color indexes may be defined by associating a desired color specified in RGB (red-green-blue) intensities with a color-index number; the color values of primitives are then given as the appropriate index.

Viewing and Transformations: GKS allows the user or programmer to define a coordinate space, called the *world coordinate space*, that is appropriate for each application. This world coordinate space is mapped into device coordinates in a controlled manner through two distinct operations: normalization

transformations and workstation transformations GKS first transforms world coordinates into a normalized-device-coordinate (NDC) space by defining a working region, or window, in world-coordinate space, NDC space acts as an abstract viewing surface or an intermediary space between applications and devices. The NDC space is then transformed into the device coordinates (DC) of the workstation. When multiple workstations are used, each may have a distinct view of the application by setting its own workstation window. The last transformation allows the workstation to set a viewport, the active region of the device's potential workspace, which can be used for scaling and translating the original picture (see figure 2).

Graphics Input: A full set of input operations allows an application program to receive input from a broad range of interactive input devices. The input operations are grouped into five classes: choice, locator, pick, string, and valuator. This vital flexibility allows GKS to support the optimum input device for a particular working environment. The result is improved interactivity through which the full potential of the graphics man/machine interface can be realized. The request-locator function returns the position of an image entity in world coordinates, while the request-valuator function returns an indication of the current value of a continuous valuator device such as a potentiometer. The request-choice function returns an integer that represents one of a set of choices. The pick function returns the graphics segment number that corresponds to the objects being selected with graphics input. Finally, the request-string function reads character input from a keyboard device. The way in which these logical functions are implemented (through a joystick, a mouse—like the one used with the Apple Lisa, function keys, etc.) is workstation dependent.

**Inquiries:** To aid the programmer, GKS provides an *inquire* capability that allows the application program to find out information about its system environment: the current operat-

## "POWER IS A GREAT PROGRAM" - InfoWorld Software Review Nov 8/82

The first super program that puts you in control of CP/M.®

POWER! works with CP/M or MP/M on any computer,

POWER! gives you complete control over CP/M!

Ever accidentally erased a file? POWER! restores erased files!

Ever fiddled with PIP in copying files? POWER! replaces PIP and is faster and easier. You simply pick files to be copied from a numbered menu. POWER! feeds the names to CP/M for you - no need to type file names, no typing errors...ever!

Tired of CP/M's scrolling through text files? POWER! goes through files for you, page by page, file by file, or line by line with instant halt at your finger tips.

Ever lost data on a glitched disk? POWER! tests disks and fixes alitched disks.

**Damaged Directory?** 

POWER! allows you to repair the directory!

Afraid of HEX numbers?

POWER! automatically converts HEX to DECIMAL, BINARY & ASCII.

Need to patch or change a program? POWER! searches memory, displays memory, and lets you change memory wherever you want.

Want to locate a file?

POWER! sorts the directory. searches all disks or all user areas automatically for files for you.

Annoyed at having to keep a system disk in Drive A:? POWER! doesn't require a system disk in any drive.

Renamed a file using = and all that typing? POWER! lets you pick files from a numbered menu and prompts for every action.

Ever accidentally overwritten a file? POWER! checks first and asks permission.

**MORE THAN** 



ONLY \$149 (\$2.75 EA. UTILITY)

**POWER!** frees your disk space since it uses less than 15k

POWER! versions for CP/M or MP/M on any computer.

TRY IT ON US! MONEY BACK GUARANTEE

Need to manipulate data on a disk? POWER! reads and writes any track or sector independently.

Ever make a mistake in the DDT? POWER! loads disk data to ANY memory address, not just 100, and writes to the disk from any memory address. POWER! Single-Steps through memory, moves memory, compares memory sectors, tests memory, allows you to change memory and saves to disk using Decimal numbers.

NOW POWER! permits you to securely lock any file with your password to protect sensitive information from prying eyes. PASSWORD program included FREE with every POWER! order.

Dislike BDOS errors? POWER! ends BDOS errors, and gives you a way out.

Trouble identifying files?

POWER! marks original files and their copies for you. POWER! also compares files and finds identical copies regardless of name.

Can't remember odd file or program name abbreviations? POWER! lets you deal with disk files by number. Never type or mistype file names again.

POWER! does more.. NEW version of over 55 command utility programs is the only CP/M housekeeper you will ever need to really get control of your computer. A great buy, too, at less than \$2.75 each.

Previous purchasers of POWER! Exchange your original disk for updated version with the new commands and brand new manual. \$35.00

credit card, check or C.O.D.

## JOIN OTHER POWER USERS

E. I. Dupont Sperry Univac NY Stock Exchange Princeton Univ Livermore Labs Union Carbide UC Berkeley UC San Francisco Bendix Corp Fort Motor Co.

Xerox Corp Conn. Gen. Life 1TT Dow Chemical Advanced Logic Sys. Charlston Univ Univ Helsinki Honeywell

AMF Syracuse Univ Olivetti New Mexico State Monsanto Chemical Univ Minnesota US Dynamics City Bank

COMPUTING! 2519 Greenwich, San Francisco, CA 94123

See Us at CPM 83 Show



### COMPUTING! 2519 Greenwich, San Francisco, CA 94123 TOLLFREE (800) 227-3800 Ext 28 **DEALERS** and OEM's IN CA: (800) 792·0990 Ext 28 (415) 567-1634 □ CP/M \$149 □ CP/M-86 \$149 □ MP/M \$198 California add 61.2% sales tax.

Ex Date Card No. Name Company Address State Computer

## **Your Systems Specialist**

## CompuShack







**PDS UNIVERSAL PRODUCTS** 

## **TRUMPCARD**

A unique memory card with 256K Ram Game I/O and Serial I/O. . . \$499.00

## TRUMP CARD II

Serial I/O and 512K fully populated memory card . . . . . . . . . \$699.00



## TRUMP CARD V

Features Parallel and Serial I/O. Game 1/O and a Clock/Calander with battery back-up. A fully populated 256K memory board . . . . . . . . . \$599.00

## QUADRAM

Quad Board - 256K, Parallel Port, Serial I/O. Clock Calendar with battery backup ..... \$599.00 512K Ram with Serial I/O.... \$799.00 Microfazer Parallel . . . . . . \$199.00 Microfazer Cable . . . . . . . . \$37.95 Quad Color I. . . . . . . . . . \$299.00 Quad Color II 640 x 200. . . . \$499.00 Quad Color III 640 x 400 . . . \$699.00

## IBM PC- COMPLETE LINE

## **IBM**

PC Complete System: includes 64K IBM-PC with 2 Floppy Disk Drives, Floppy Drive Controller, 12" monitor, Color Graphics card. All for

## only.....\$2899.00

## **AST COMBO CARD**

AST Combo Card 256K ram, Parallel Port, Serial Port, Clock Calendar and Battery back-up . . . . . . . . \$599.00

## **MAYNARD ELECTRONICS**

Floppy Disk Controller . . . . \$179.00 Floppy Disk Controller w/Parallel Port ..... \$229.00 Floppy Disk Controller w/Serial

Port . . . . . . . . . . . . \$239.00

## **HERCULES GRAPHICS CARD**

This card gives you 720 x 350 graphics capabilities and it is completely compatible with DOS software for only.....\$489.00

Prices subject to change without notice

## **BIG BLUE**

Dual I/O ports, dual processing, Serial port, Parallel port, 5 MHZ, Z80 B, 64K. Hard disk interface. Clock/Calendar. let's you run existing CP/M software. List \$589..... Ours \$479

## TALL TREE SYSTEMS

JRAM 512K, allows PC to address ONE MEGABYTE Electronic Disk. . . \$800 EA. JFORMAT lets you mix and match Drives: single/dual/quad/Electronic/ 8"/Hard Disk + Printspooler and 10 spector formatting......\$60.00

## FLOPPY DISK DRIVES

### **TANDON**

TM-100-1 SS/DD . . . . . . . . \$189.00 TM-100-2 DS/DD..... \$249.00 TM-100-4 DS/DD......\$359.00 TM-848-1 SS/DD . . . . . . . . \$425.00 TM-848-2 DS/DD......\$499.00 **SHUGART** SA400 SS/SD..... \$175.00 SA450 DS/DD......\$250.00 SA800/801 SS/SD..... \$365.00 SA850/851 DS/DD..... \$459.00 QUME DT-5 DS/DD.....\$269.00 DT-8 DS/DD...... \$469.00

## AMDEK-3 COMPACT 3" MICRO-FLOPPYDISK **DRIVE SYSTEM**

This 3" Amdek Micro-Floppy disk Drive offers up to I Megabyte storage. Two drives (with built-in power supply) are furnished to commodate Micro-Floppydisk Cartridges. . . . . . . . . \$699.00

## HARD DISK SYSTEMS

For IBM and Apple from Devong

5MB. . . . . . . . . . . . . . . . . \$1595.00 Complete subsystem with software, cables and power supply.

## **PRINTERS**

## **EPSON**

| MX-80 W/graftrax plus    | \$439.00 |
|--------------------------|----------|
| MX-80 FT W/graftrax plus | \$499.00 |
| MX-100 W/graftrax plus   | \$659.00 |
| Atari to epson cable     | \$35.00  |
| IEEE Pet                 | \$25.00  |
| Apple parallel           |          |
| IBM to epson             | \$46.00  |
| MX-70, MX-80, MX-80 FT   |          |
| ribbons                  | \$14.00  |
| MX-100 ribbons           | \$24.00  |
|                          |          |

\*APPLE, is a Trade Mark of Apple Computers, Inc. \*IBM, is a Trade Mark of IBM Corp.

### **BROTHER**

| HR-1 A parallel               | . 789  |
|-------------------------------|--------|
| HR-1 A serial                 |        |
| Tractor feed option           |        |
| Print wheel                   | \$24   |
| Multi strike ribbon (dozen)   |        |
| One time film ribbon (dozen). | . \$32 |
| SMITH CORONA                  |        |
| TP-1 parell                   | \$579  |
| TP-1 serial                   | \$579  |
| Nylon black fabric ribbon     |        |
| (dozen)                       | \$49   |
| Mylar multi strike (dozen) .  |        |
| Print wheel                   | \$9    |



## NEC **SPINWRITER**

| 7710-1 |   |   |   |   |   |      |      |  |       |  | ٠ |  | \$22 |
|--------|---|---|---|---|---|------|------|--|-------|--|---|--|------|
| 7715-1 |   |   |   |   |   |      |      |  |       |  |   |  |      |
| 7720-1 |   |   |   |   |   |      |      |  |       |  |   |  |      |
| 7725-1 |   |   |   |   |   |      |      |  |       |  |   |  |      |
| 7730-1 |   |   |   |   |   | <br> | <br> |  | 10.00 |  | × |  | \$22 |
| SPINW  | R | ľ | Γ | Ε | R |      |      |  |       |  |   |  |      |

| 3510 |  |   |    |   |   |     |   |      |   |    |    |   |  |    |    |    |   |      |
|------|--|---|----|---|---|-----|---|------|---|----|----|---|--|----|----|----|---|------|
| 3515 |  | e |    |   |   |     |   |      |   |    |    |   |  |    |    |    |   | \$14 |
| 3520 |  |   |    |   |   |     |   | 0.50 | ė |    | e. |   |  |    |    |    |   | \$19 |
| 3525 |  | × | 8  | à | * | 181 | * |      | 2 | 25 | 1  | ÷ |  |    | 21 | 14 | v | \$ 1 |
| 3530 |  |   | 20 |   |   | 8   |   |      |   |    |    |   |  | 16 |    |    |   | \$1  |

## **OKIDATA**

| 82A              | \$420  |
|------------------|--------|
|                  |        |
| 83A              | \$699. |
| 84AP parallel    | \$999. |
| 84AS serial      | 1099.  |
| 82A tractor feed | \$69.  |

Parallel cable [Okidata to Apple or

Atarı] . . . . . . . . . . . . . . \$29.

## **MONITORS**

## AMDEK

| AMDEK                  |        |
|------------------------|--------|
| Video 100              | \$89.  |
| Video 300              |        |
| Video 300A (Amber)     | \$159. |
| Video 310 (for IBM PC) | \$179. |
| Color I 13" composite  |        |
| monitor                | \$299. |
| Color-II (Hi-res)      | \$669. |
| Color-III (Med-res)    | \$399. |
| Color-IV               | \$999. |
| DMV Board for Apple II |        |
|                        |        |

Business & Home Computers



MDEK

olor II 16 color modulation

tari to Color I interface

1201M 12" green

LECTROHOME

OMREX

IC-20 to Color I interface

kit.....\$9.99

cable . . . . . . . . . . . . . . . . . \$19.95

cable . . . . . . . . . . . . . . . . 19.95

screen . . . . . . . . . . . \$169.00

I-1212M 12" color (Lo-Res). . . **335.00** 

-1203DH (A) 12" (Hi-Res) . . . \$752.00

IBM . . . . . **\$26.95** 

NEC.....\$29.95

RGB monitor (Med-Res) . . . **\$299.00** 

RGB monitor (Hi-Res) . . . . **\$549.00** 

TSC module . . . . . . . . . . \$25.00

upercolor Board . . . . . . . \$199.00

color IBM cable . . . . . . . . \$39.00

color IBM cable . . . . . . . . \$39.00

IEC PC-8000 cable . . . . . . . \$39.00

THE THEFT

monitor . . . . . . . . . . \$299.00

monitor.....\$499.00

ps. . . . . . . . . . . . . . \$249.00

R-5500 12" monochrome

R-6600 13" color RGB

R-6500 13" composite color

ABINETS/POWER SUPPLY

Pual 5¼" disk drive cabinet/

ngle 5¼" disk drive cabinet/

drives, cabinet/power

Pual 8" disk drive cabinet/

691 video interface cable for

692 video interface cable for



## APPLE II+ COLOR COMPUTER SYSTEM

Ram, two "DataDrive" disk drives, controller card, Z80 card, 80 Column card and a high quality Comrex 6500 composite color monitor.... \$2499 AppleII+ Computer System with 48K of memory. "DataDrive" disk drive, controller card, 12" green screen hicontrast monitor. All cables and manuals are included for a CompuShack price of ..... \$1599 For the same system listed above with a

Apple II+ computer system with 64K

## OTHER PRODUCTS FOR APPLE II

16K card, Z80 card and an 80 Column

## **PDS UNIVERSAL**

Z80 card CP/M included.... \$159.00 80 column card . . . . . . . . . \$199.00 Disk drive controller card W/ diagnostics software . . . . \$99.00 Disk drive controller . . . . . . \$79.00

## **PDS**

DATA DRIVE®

100% Compatible disk drive for Apple II +. **\$279.00** 



SUGGESTED RETAIL PRICE . . . \$429.00 Drive with controller card ... \$359.00 SPACE SAVER

Slim line drive for Apple II + ... \$399.00

Woodland Hills

Denver

Twin Falls

## (714) 730-7207

## R. H. ELECTRONICS

Super fan II and one outlet . . . . \$59.95 Super fan II W/Zener Ray and two outlets . . . . . . . . . . . . \$79.00

## HAYES MICROCOMPUTER **PRODUCTS**

Micromodem II.....\$299.95 Smartmodem 1200 baud full duplex.....\$529.95 Micromodem II manual/ diskette . . . . . . . . . . . . . . . \$ 15.00 T G PRODUCTS

Game paddles . . . . . . . . . \$29.95 Joy stick. . . . . . . . . . . . . . . . \$45.95 Select a port . . . . . . . . . . \$45.95

## STREET ELECTRONICS

ECHO II speech synthesizer . . . \$175.00

## THE OSBORNE 1 PERSONAL **BUSINESS COMPUTER**

The Osborne 1 comes standard with 64K Ram, 2 Floppy Disk Drives, Serial Interface, Modem Connection, IEEE 488 Interface C Basic, CP/M and Supercalc for the Best Price In The Country... Call

## FRANKLIN ACE 1000 COMPUTER SYSTEM

64K Ram, Upper and Lower case letters, 12 Key numeric, Alpha Lock, Visicalc Keys, Two "Data Drives" and Controller, 12" (green) monitor . . . . \$1699 

## KAYPRO II COMPUTER SYSTEM

64K Ram, Perfect Writer, Perfect Filer, Perfect Speller, Perfect Calc, S-Basic, CP/M version 2.2, two disk drives, 9" (green) monitor, RS232 interface, Parallel Printer interface, and Weatherproof carrying case ...... \$1699

WE'RE OPENING RETAIL STORES THROUGHOUT THE U.S.A. **SOON!** 

## OMPUSHACK

## FRANCHISE INQUIRES WELCOME

## CALL YOUR LOCAL COMPUSHACK DEALERS:

## ps......**\$69.00** single side double density 8" disk supply . . . . . . . . . . . . . . \$895.00

California Anaheim Concord La Mirada Newport Beach San Diego San Jose Tustin Walnut Creek

(213) 947-6284 (714) 457-2149 (408) 973-1444 (714) 730-7207 Westminister

(213) 888-0030 (303) 422-3925

(312) 964-4612 Great Falls (406) 721-1811 Missoula Albany

Rochester Rome

Texas Washington Wisconsin Verona

Illinois

Montana

New York

Austin Richland Spokane Canada

(315) 336-0266 (512) 258-1062

(608) 845-7110

Toronto 01-935-0480 London

Sales and Service:

(714) 730-7207

CIAL PRICES

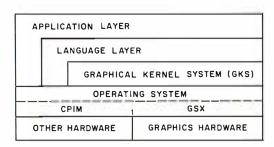
Headquarters Telex: 181667

Answer Back COMPDSHAK TSTN

Colorado

Idaho

ALL FLOPPIES REPAIRED QUICKLY AT LOW COST



**Figure 3:** This layer model shows the relationship of GKS and VDI to other components in a graphics system. Each module may call the functions of the adjoining layer below. An example of this is the Graphics System Extension (GSX) to the popular CP/M family of operating systems.

ing state, primitive attributes, viewing operations and transformations, and device capabilities.

## **Device-Level Interfaces**

Two emerging standards are addressing the hardware-driver interface level. One of these, the North American Presentation-Level-Protocol Syntax (NAPLPS), was developed by a team at Bell Laboratories as an extension of graphics developments in the Canadian Telidon videotex system. (See the article "NAPLPS, A New Standard for Text and Graphics: Part 1" by Jim Fleming and Bill Frezza on page 203.) NAPLPS (pronounced "nap-lips") has been adopted by AT&T as a standard for transmitting text and graphics over telecommunication lines. In some computergraphics applications, NAPLPS probably will "sit below" another, more general, device interface called the Virtual Device Interface (VDI). This relationship is illustrated in figure 1, where the NAPLPS block is placed under the dashed line of the Virtual Device Interface.

The VDI standard is being developed by the ANSI X3H33 Technical Committee as a standard interface between device-independent software and graphics devices. VDI makes all devices appear as identical virtual graphics devices by defining a standard input/output protocol. The unique characteristics of the physical graphics device are isolated in the device-driver software module. This technique has been employed by individual vendors to make their own products compatible with a wide range of devices, similar to the way

operating systems such as Unix or CP/M are interfaced to a multitude of hardware configurations. VDI takes the concept a step further by providing potential industry-wide compatibility.

The VDI specification is expected to be frozen during the summer of 1983. For the graphics-equipment manufacturer, the adoption of this standard means that a VDI driver for a particular graphics device need be written only once. All graphics applications that conform to VDI would then be able to communicate with the device through the standard device driver. Long-range benefits will be more evident as equipment and semiconductor manufacturers begin implementing more of the softwaredriver functionality in hardware-in effect moving the VDI interface down into the graphics device itself. This development in graphics is a direct parallel to other standardization efforts, such as the Shugart Associates Standard Interface (SASI) for disk-drive subsystems. The SASI hardware and protocol specification allows OEMs (so-called original equipment manufacturers) to freely mix disk subsystems and host computers made by different firms. The popularity of this approach stems from the many benefits it offers to the industry: less design effort expended reinventing the wheel, numerous second sources of parts, higher reliability with a proven design, reduced costs, and larger markets. Similar benefits will accrue to computer graphics as a result of the standardization efforts that are at last bearing

## Graphics Standards as Products

Although the cost of hardware, especially semiconductor memory, is usually cited as the major inhibitor to truly widespread use of interactive graphics, this is becoming less and less accurate. The lack of universal standards has dulled the impact of the dramatic reduction in component costs in the past decade. The impending advent of these important standards paves the way for implementations of computer graphics that will enjoy widespread availability and economies of scale. The success of this approach has been demonstrated in the microcomputer world by such de facto standards as the 8080-compatible microprocessors and the CP/M operating system.

Digital Research in collaboration with Graphics Software Systems Inc. (GSS) has recently responded to the potential offered by the new standards by expanding the capability of the CP/M family of operating systems with an upgrade called the Graphics System Extension, or GSX. This upgrade provides full graphics capabilities to the user through the normal CP/M function-call access mechanism. The architecture of GSX has been carefully designed to allow the extended CP/M to maintain compatibility with nongraphics applications and to use system resources in a way that is consistent with a smallsystem environment, according to the structure shown in figure 3.

Digital Research has also provided a package called GSS-Kernel that presents a GKS interface to the graphics-application programmer using the graphics functions provided by GSX. GSS-Kernel, a linkable runtime library, will increase programmer productivity while providing program portability through the standard GKS interface. In addition, applications using GSS-Kernel will be source-code compatible with large computer systems running GKS procedures libraries.

### **GSX Architecture**

GSX is composed of three major components: the graphics-device operating system, the graphics input/output system, and the Gengraf



# Introduce your Apple to thousands of new programs with the new Microsoft Soft Card.

A more powerful Apple. When you add the new Microsoft SoftCard system to your Apple II or II Plus, you also add the ability to run thousands of CP/M-80® based programs. Languages. Utilities. Applications programs that range from word processing and data base management to analysis and forecasting tools. Thousands of software tools for business, professions and the home. Tools that can turn your Apple into a far more productive machine. And, the new SoftCard system is enhanced, allowing you to run 60K programs. If you already have a SoftCard system, ask your dealer about Microsoft's inexpensive upgrade kit.

Two computers in one. With the SoftCard system, your Apple becomes two computers. One that runs Apple software, another that runs CP/M-80. Which means you'll double the utility of your computer.

A complete solution. The SoftCard system includes everything. The easy-to-install SoftCard circuit board. The CP/M-80 operating system. Microsoft BASIC plus GBASIC for graphics applications. And, the utilities you need to manage CP/M-80 files.

Why Microsoft? Microsoft was the first personal computer software manufacturer. The very first. Today, Microsoft software is running on well over a million computers worldwide. There's a reason. Microsoft has earned a reputation for better

constantly being enhanced. And when the enhanced versions are ready, we make the enhancements available to our customers. Like the 60K enhancement for the SoftCard system. That kind of product support is just one of the ways we earned our reputation.

Ask your dealer. Ask about the superior applications programs the SoftCard system makes available to your Apple. High quality programs for almost every area of home, business, and professional use. Then, ask for a demonstration of the complete Microsoft SoftCard package... and any of those thousands of new programs

software. Products that work. Products that are

BETTER TOOLS FOR MICROCOMPUTERS

## MICR@SOFT...

MICROSOFT CORPORATION 10700 NORTHUP WAY BELLEVUE, WASHINGTON 98004

Microsoft is a registered trademark of Microsoft Corporation SoftCard is a trademark of Microsoft Corporation Apple is a registered trademark of Apple Computer, Inc. CP/M-80 is a registered trademark of Digital Research, Inc.

Circle 275 on Inquiry card.

you can introduce to your Apple.

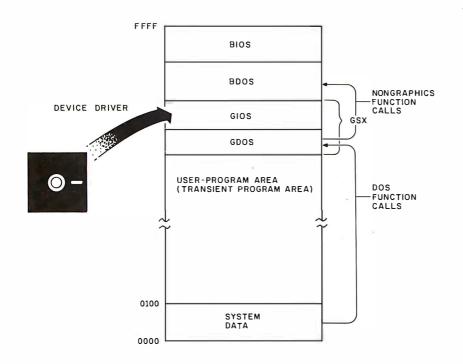


Figure 4: GSX consists of the device-independent (GDOS) and device-dependent (GIOS) components. These are loaded at run time below the BDOS (basic disk operating system) module in high memory. Initial loading of GIOS and GDOS from the system disk is performed by a loader routine attached to the application program by the GSX Gengraf utility when the program is created. During operation, graphics workstations may be changed by making a request to GDOS that causes a new device driver to be loaded from the disk.

utility routine. The graphics-device operating system, or GDOS, is analogous to the BDOS (basic disk operating system) module in the standard CP/M system and contains the device-independent portion of GSX. The graphics input/output system, or GIOS, contains the device-dependent drivers which, like the basic input/output system (BIOS) in standard CP/M, provide the necessary "glue" to connect GDOS with the particular characteristics and command sequences of a specific graphics device. Finally, the Gengraf utility configures a graphics-application program to run in the GSX environment.

Figure 4 shows the relationship of software components of a GSX-extended CP/M-80 system. GDOS and GIOS form a path to graphics devices that is essentially parallel to the BDOS and the BIOS. Normal operating-system calls, such as reading from or writing to the console or a disk drive, are initiated by the BDOS, and the BIOS provides the device-

dependent interface. Graphics calls are intercepted and serviced by GDOS and passed to the appropriate device-dependent driver within GIOS. In reality, only one device-driver routine is resident in memory at any time; the other device drivers are stored on disk. The application program may request use of a new workstation at any time, and GSX will insure that the proper device driver is loaded as needed. This choice of implementation maximizes the memory available for the application program.

Graphics-Device Operating System: Access to all graphics operations is through function calls to GDOS, made in the same manner as BDOS calls except that an additional parameter list is specified to transfer graphics information. This information includes a graphics operation code, a control array, a parameter array, and a point array. Point locations are passed to GSX in a normalized-device-coordinate space. Here all point locations are specified

with *x*, *y* coordinates between 0,0 and 32767,32767. GDOS then transforms the NDC coordinates into the device coordinate system through a scaling operation using device-specific information that was passed when the current workstation was opened for use. This scheme not only provides a VDI-compatible method of passing coordinate values, but also allows points to be specified as integer arrays, thus saving memory space and processing time.

GDOS is also responsible for dynamic workstation assignment. Each device on a system is associated with a workstation-identification (ID) number. When GDOS receives a request to assign a workstation (change the currently active graphics device), it determines which driver corresponds to the indicated workstation and loads that driver into memory. The new driver is loaded into memory in the same locations formerly occupied by the previous driver so that memory requirements are minimized. The logical association of workstation ID number to a particular device is made through an assignment table, a text file stored on the system disk. You can alter the correspondence of workstation ID to specific device drivers simply by editing the assignment-table file with any text editor.

Graphics Input/Output System: The GIOS component of GSX contains the device-dependent code that translates between the Virtual Device Interface and the unique characteristics of a real graphics device, making all graphics devices appear to the application program as identical virtual devices. The VDI specifies the pseudo-operation code for a graphics operation as well as a set of input and output arguments. The input arguments include an array of control parameters, an array of input parameters, and an array of input point coordinates. The output arguments include control parameters, output parameters, and output point coordinates. The control, input, and output parameters are unique to the particular operation being performed (see table 1).

Often, the capabilities specified by



## S-100 World News

MACROTECH International Corporation

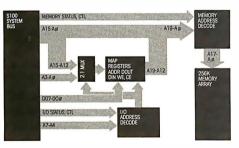
22133 Cohasset Street, Canoga Park, California 91303 • 213-887-5737

## Megabyte S-100 Memory Here Now



## M<sup>3</sup> Family Growing

Another product recently introduced by Macrotech is soaring to the top of the bestseller list. The Multiuser II is a 128 kbyte 70ns CMOS static ram memory board that is unquestionably without peer in the S-100 marketplace. It's a 6-layer board with blazing speed, 8/16 data transfer protocol, and ultralow power external battery support. The same M<sup>3</sup> memory mapped addressing architecture so in demand with system software professionals is now standard in the new Multiuser II. M<sup>3</sup> was first developed by Macrotech for the popular Multiuser I 256K dynamic ram board to meet the demanding requirements of today's sophisticated systems.



Macrotech's advanced memory mapping scheme allows each 4K block of the 16 bit (64K) logical addresses to be dynamically translated to any 4K block of the physical memory. Global memory can be configured to any size and located anywhere in the logical address space. All remaining memory can be addressed through the remaining logical address space by simply reloading the mapping registers to address the desired physical memory blocks. This scheme permits unlimited use of all on-board physical memory.

## Major breakthrough made by **Macrotech International Corporation**

CANOGA PARK (MI)-January 20, 1983-Mike Pelkey, president of Macrotech International Corporation, today announced a major technological breakthrough in S-100 dynamic memory board density. A full megabyte of high speed dynamic ram is contained on a single standard size S-100 multilayer P.C. board. The product, dubbed 'Max' meets all IEEE/696 mech-

anical and electrical specifications and byte parity generation/checking is included as a standard feature. Max supports IEEE/696 24bit addressing (selectable at any 128K boundary), 8/16 data transfer protocol, phantom line operation, and the same ultra low noise bus signal filtering provided on Macrotech's popular high performance 256K dynamic memory board.

Max is in production now and shipping at the all-time low cost per bit list price of \$1,983 in unit quantity.

Bruce Kimmel, Macrotech's sales manager reports that customers are being served on a "first-in, first-out" basis and warns that due to a high incidence of graphics and similar memory-intensive applications, along with an unwillingness in the trade to pay exorbitant prices for memory, backlogs may occur for Max which could delay shipments against some late orders. With the improbability of second sourcing for some time, interested parties are urged to get orders in as soon as possible. Bruce can be contacted at 22133 Cohasset Street, Canoga Park, California 91303, or reached by telephone at (213) 887-5737.

## Virtual Disk Flexibility Cited

CANOGA PARK-January 20, 1983-Macrotech reports their Multiuser I and Multiuser II S-100 ram memory boards can be used as both system memory and "virtual disk" storage in eight or sixteen-bit applications. Addressing flexibility is the key. The Multiuser M<sup>3</sup> memory mapped addressing is guaranteed to allow memory partitioning to fit the exact requirements of your system without ever wasting a single byte.

Today's trend in operating systems appears to include extended memory capabilities to allow for the recent technological advances in semiconductor memory. A close look at Digital Research's new CP/M 3™ for example, would lead you to believe that it was especially created to fit Macrotech's family of Multiuser memory boards. (It wasn't, but try to find one that fits better.)



Where it all started: pictured is the popular Multiuser I, Macrotech's first product. This widely used board provides 256 Kbytes of dynamic ram with 4K page memory mapping (called M³), 8/16 bit operation, 24 bit addressing and byte parity checking.

## *MACROTECH* Announces Distribution Expansion

CANOGA PARK-January 20, 1983-Macrotech is now establishing domestic and international dealer/representative networks. The California based firm is expanding it's customer support through these channels and invites inquiries. Volume users and retailers should contact the company for details.

Macrotech's marketing director Bob Ryle states, "IEEE/696 has made S-100 legitimate. It is rapidly gaining acceptance due to its inherently superior speed characteristics." Ryle attributes the growing demand for Macrotech memories to Macrotech's strict adherence to the IEEE standard. Circle 240 on inquiry card.



If you know anything at all about Computer Furniture and Accessories, you know that we bend over backwards to make our customers happy. That's why we'll modify our standard line of computer desks and accessories to meet your special requirements. With custom tops and desk configurations, special data shelves, micro shelves, risers, keyboard recesses, cable cutouts and paper slots, as well as custom paint and top laminate colors. At CF&A you get all this plus durable construction, reasonable cost, and personal

service. More ever, than CF&A is aiming to please.



**Computer Furniture and Accessories** 515 West 132nd Street Gardena, CA 90248 (213) 327-7710

**Houston Warehouse: Hamilton and Associates** 8050 El Rio Houston, TX 77054 (713) 741-1505

## Op Code Description

- Open Workstation: initialize a graphics device (load driver routine if necessary)
- 2 Close Workstation: stop graphics output to this workstation
- 3 Clear Workstation: clear display device
- Update Workstation: display all pending graphics on workstation
- 5 Escape: enable special device-dependent operation
- 6 Polyline: output a polyline
- 7 Polymarker: output markers
- 8 Text: output text starting at a specified position
- 9 Filled Area: display and fill a polygon
- 10 Cell Array: display a cell array
- Generalized Drawing Primitive: display a generalized drawing primitive 11 function
- 12 Set Character Height: set text size
- 13 Set Character-Up Vector: set text direction
- 14 Set Color Representation: define the color associated with a color index
- 15 Set Polyline Line Type: set line style for polylines
- 16 Set Polyline-Line Width: set width of lines
- 17 Set Polyline-Color Index: set color for polylines
- 18 Set Polymarker Type: set marker type for polymarkers
- Set Polymarker Scale: set size for polymarkers 19
- 20 Set Polymarker-Color Index: set color for polymarkers
- 21 Set Text Font: set device-dependent text style
- 22 Set Text-Color Index: set color of text
- 23 Set Fill-Interior Style: set interior style for polygon fill
- 24 Set Fill-Style Index: set fill style for polygons
- 25
- Set Fill-Color Index: set color for polygon fill
- 26 Inquire Color Representation: return color representation values of index
- 27 Inquire Cell Array: return definition of cell array
- 28 Input Locator: return value of locator
- 29 Input Valuator: return value of valuator
- 30 Input Choice: return value of choice device
- 31 Input String: return character string
- 32 Set Writing Mode: set current writing mode (replace, overstrike, complement, erase)
- Set Input Mode: set input mode (request or sample)

**Table 1:** Operation codes available under the Graphics System Extension (GSX).

the VDI standard are not provided by a particular graphics device. In some cases, the device-driver software emulates the required function. For example, four line styles are specified by VDI: solid, dashed, dotted, and dashed-dotted. If a graphics device does not have the ability to produce these directly, their automatic generation is emulated in software. For example, if a dotted line cannot be produced by a device, the required line style is produced by generating a series of short solid lines with intervening spaces.

Gengraf: The final component of GSX is the Gengraf program. Gengraf is a utility program used by the application programmer to configure a graphics program for use with GSX. Gengraf appends a special loader routine onto the graphics program. This loader brings GDOS into memory and loads the default graphicsdevice driver before execution of the graphics program begins; therefore, GSX (GDOS and GIOS) is brought into memory only when a graphicsapplication program is executed. Otherwise, the programmer has use of the full user-program space available under CP/M.

The loading and linking of GSX is completely transparent to the user at run time. In CP/M-80, the linkage to GDOS is established by the Gengraf loader at run time by a substitution of the GDOS entry point in place of the



"Quality Throughout" 800-238-3100

O.T. Products Division COMPATIBLE COMPUTER CORP. 3330 South Third St. West Salt Lake City, UT 84115 @ (801) 974-0999

Q.T. Systems Division **GOLDEN WEST COMPUTERS** 60 North 300 West Provo. UT 84601 Ø (801) 373-1467

NOTICE: CP/M is a trademark of Digital Research, Turbodos of Software 2000 and INFOWARE of Compatible Computer Corporation. The 0.T. products and systems above are produced and sold under license by Compatible Computer Corporation and Golden West Computers, Inc. The 0.T. trademark and product designs remain the property of the licensor, 0.1. Computer Systems, Inc. of Hawthorne, Calif.

### **NEW IMPROVED 1983 MODELS**

The entire Q.T. product line has been redesigned and improved using computer controlled manufacturing techniques to insure the highest quality. Many new features have been added to every item. The Q.T. 1983 models are among the best S-100 products available on the market today. They are fully compatible with the latest 16/32 bit cpu's.

Call (800) 238-3100 today for the location of your nearest dealer and/or to obtain the 1983 O.T. catalog. Substantial dealer/OEM discount offered.

Stocking dealers with retail showrooms and mail order facilities include:

Priority One, Chatsworth, CA ⊗ 800-423-5922 Bison Products. Los Angeles. CA Compatible Computer, New York City 

○ 212-221-7900

TERMS: Cash prepayment @ 2% discount, COD or net 30 days with prior credit approval. Initial dealer/OEM orders must be COD or prepaid (MC/V/sa credit card OK). Purchase orders accepted from OAB rated firms. Shipping and handling charges estimated at \$0.50/Ib UPS ground and \$1.00/Ib UPS Blue Label or airfreight. Minimum \$3.00. Utah residents add sales tax. Export orders welcomed—telex 426382 ITR UI.

## Q.T. DISCOUNT MICRO-SYSTEMS PACKAGES



O.T. MAXI-SYSTEM PACKAGE - Model 800P

List \$7.995.00—Save \$1.600.00

-Televideo 925 Full Featured CRT -QT 8" Mainframe with 8 slot Motherboard

—Choice of printer: C. Itoh F-10 daisy wheel or Oki data M84P high speed dot matrix (200 cps.)

The Q.T. Maxi-System is an industry standard S-100 expandable microcomputer which is ideal for general business computing, word processing and data base management applications. CP/M operating system is standard. MP/M or Turbodos optional. Unique Infoware<sup>®</sup> utilities simplify operation and user training.

• Electronics on Two Cards • 64K RAM Standard • 4MZ Z80A CPU

· Filtered Fan

- · Parallel Printer Port
- Two A.C. Outlets
- Package Price Includes Cables, Documentation & Utility Programs
- Key Lock Switch
  - Model 800 alone . . . . . . . . . . . . . . . . . \$4,995

· Universal Disk Controller

- 2 Megabytes on line
- 10-40 MB Hard Disk Option Expandable to 256K RAM • Two Serial Ports

Q.T. MINI-SYSTEM PACKAGE - Model 500P

\$3,995.0

List \$4,995.00—Save \$1.000.00

- -Q.T. 51/4" MINI-FRAME w/6 slot MB
- —Televideo 910 Green CRT
- -Dot Matrix printer (M82A)
- · CP/M standard. Turbodos optional.
- Reliable Single Card Electronics
- Z80 CPU/Universal DMA controller
- Dual Double Sided/Density Drives
- Memory: 64K RAM & 320K Disk Drive
- Cables, manuals, Infoware Utilities
- Model 500 alone ...... \$3.495.00

## Q.T. INDUSTRY STANDARD S-100 M







### Q.T. MICRO-FRAME® - Series 600

Desk Top-Plain Front Panel

- . 6 to 22 slot Motherboard
- Full I/O Cutout Array
- Fused EMI/RFI Filter
- · Heavy Duty Power Supply  $(+8V@16A \pm 16V@3A)$

| No MB \$499      |
|------------------|
| 6 slot MB \$599  |
| 8 slot MB \$649  |
| 12 slot MB \$699 |
| 18 slot MB \$799 |
| 22 slot MB \$899 |
|                  |

## Q.T. PRO-FRAME® - Series 700

Rack Mount - Constant Voltage

QTC-RM + 12 12 slot MB . . . \$799 QTC-RM + 18 18 slot MB ... \$899 QTC-RM + 22 22 slot MB ... \$999

## Q.T. MINI-FRAME®—Series 500

- Desk Top-Dual Mini Drives Holds two 5¼" Drives
- Full Cutout Array • 6, 8, or 12 slot MB.
- Fused EMI/RFI Filter
- · Hard Disk Power Supply  $(+8V@16A, \pm 16V@3A,$ ±12V@5A, +5V@5A)

QTC-MF + MD(No MB) \$699 . \$799 6 slot MR

QTC-MF + MD6QTC-MF + MD8 8 slot MB \$849 QTC-MF + MD12 12 slot MB \$899

## Q.T. MAXI-FRAME® - Series 800

Desk Top for Dual 8" Drives

- 6, 8, 12 slot Motherboard
- · Universal Drive mounts
- Key lock Power Switch
- . Heavy Duty Power supply  $(+8V@16A, \pm 16V@3A, +5V@5A,$ -5V@1A. + 24V@5A)

QTC-MF + DD1 No MB \$799 QTC-MF + DD6 w/6 s. MB .. \$899 QTC-MF + DD8 w/8 s. MB \$949 QTC-MF + DD12 w/12 s. MB. \$999

Standard features & Options: All QT mainframes are built on a strong steel chassis with sturdy heavy Standard features & Uptions: All U1 maintrames are built on a strong steel chassis with sturo heavy gauge aluminum covers. Heavy duty power supplies have individually fused outputs and are shielded by an EMI/RFI filter & line surge protector. Standard VO cutouts include provision for 16 DB 25's, 1 DC 37, 2 DA 15's, centronics parallel, 134 pin and 2 50 pin IDC ribbon cable connectors. Filtered positive pressure cooling fan. Twin AC outlets provide convenient connection for and control over printer and terminal. Standard colors are charcoal/light grey to match Televideo terminals. Optional colors include brown/tan and federal spec. ivory at extra charge. Constant voltage power available on most models—add \$100.00. EIA rack mount rails available on some units—add \$95.00. Complete OEM customization available on orders of 10 or more units. Contact factory for details and pricing.

## Q.T. DISK DRIVE CABINETS AND SUBSYST



Front-Tandon Panel



Front-no panel



## Q.T.'s All in One®

Universal Disk Drive Cabinet . Accepts all 8" drives Expandable

QT's unique new disk drive cabinet has been designed to accept virtually any 8" drive on the market today from Tandon Thinlines to 40 megabyte Quantums. Features include interchangeable face plates (Qume, Shugart, Tandon, etc.) and "electronics in a drawer" construction to simplify installation and maintenance. Heavy duty power supply will carry any combination of up to four Thinline, two standard, or one hard disk drive with floppy backup. +5V@5A, -5V@1A, +24V@5A.

| QTC-DDC8 8V-XX w/one faceplate \$399.00 |
|-----------------------------------------|
| Replacement Faceplates (Specify type &  |
| number of drives) \$25.00               |
| Tandon 4-drive power cable\$15.00       |
| Data Cables available \$20-50.00        |



SINGLE 8" VERTICAL CABINET

Size: 11"H 11"W 18"D Perfect add-on disk drive for any system. Accepts most brands. QTC-DDC8V .....\$299



**DUAL 8" HORIZONTAL DRIVE CABINET** 

Dimensions: 5"H 17"W 20"D

Designed to provide basic disk storage capacity for S-100 and other computers. Low profile permits table top stacking. QTC-DDC + 88H .....\$349

## Q.T. "ALL IN ONE" EXPANDABLE DISK DRIVE SUBSYSTEM SPECIALS

| QTC-DDS + 0 with two single sided Siemens Drive (0.5MB)  | 695  |
|----------------------------------------------------------|------|
| QTC-DDS + 1 with one double sided Mitsubishi Drive (1MB) | 895  |
| QTC-DDS + 2 with two DSDD Mitsubishi Drives (2MB)        | ,495 |

normal BDOS vector at memory location 5. GDOS intercepts all operating-system function calls. If the call is a standard CP/M request, it passes control to BDOS; if the function call is for a graphics operation, GDOS services the request. Because GDOS is loaded below GIOS, memory is automatically allocated for GIOS and GDOS; the size of the transient program area (TPA), determined by the GDOS entry point, is

automatically adjusted. The memory map in figure 4 shows how GDOS and GIOS are loaded into memory at run time below the standard CP/M-80 components, BDOS and BIOS. The GSX extension to CP/M-86 works slightly differently by reserving a special interrupt vector for GSX communications. Also, the memorymanagement facilities of CP/M-86 take care of loading the GSX modules into the free memory available.

## FRANCHISE OPPORTUNITIES.



## NEVER BEEN A BETTER TIME!

The computer industry is experiencing a spectacular growth, by 1990 it will become a 20 billion dollar industry. Computer retailing was one of the few industries not seriously effected by the recent economic crisis.

Now...is a good time to consider

a franchise opportunity with MicroAge, a leader in computer retailing. MicroAge has a proven "track record" with over thirty franchised stores throughout the United States and Canada. In an industry where experience is crucial, MicroAge has it, with six years computer retail experience and three years in franchising. It's just good sense to go with a leader.

If you're committed to success in computer retailing, it's essential you evaluate the MICROAGE COMPUTER STORES Franchise opportunity. Investment: \$130,000-\$200,000.

For detailed information about MicroAge "Franchise Opportunities," call (602) 968-3168 or write to:

MicroAge Computer Stores Inc. 1425 W. 12th Place Tempe, AZ 85281



## Conclusion

The adoption of the GKS and VDI standards at the programmer and device-interface levels offers potential object-code portability for microcomputer graphics-application programs. Not only will programmers see a consistent interface to graphics functions in their high-level languages, but compilers and graphics run-time libraries can be generic, with device dependencies residing in the operating system. Because of this, each hardware OEM will install the graphics portion of an operating system only once. Compilers and other utilities that conform to the VDI standard will then be able to access the virtual devices of a system without special adaptation. In time, the hardware manufacturer, confident of a stable device interface, will begin to place higher-level functions into the device hardware (or firmware). Eventually, graphics devices may incorporate a full VDI interface, eliminating the need for device drivers entirely.

New products, such as GSX and GSS-Kernel, that are based on the emerging standards, will contribute to the realization of widespread, lowcost computer graphics. In the past, the adoption of formal standards or the emergence of de facto standards has proved to be a powerful market stimulant. Because of its unique emphases on low cost and a competitive software environment, the microcomputer industry is especially sensitive to the benefits of graphics standardization. Graphics users owe a debt of gratitude to the many researchers who distilled an inherently complex technology into a consistent and flexible set of useful constructs. In the end we shall all benefit from the power of computer graphics.

### Reference

"Graphical Kernel System (GKS)—Functional Description," *Draft International Standard ISO/DIS7942*, version 7.02, August 9, 1982. Copies of this approximately 200-page document can be obtained for \$28 from American National Standards Institute Inc., 1430 Broadway, New York, NY 10018, (212) 354-3300.



FOR A LIMITED TIME, BUY A 256K QUADBOARD AND RECEIVE A 64K MEMORY BOARD FREE OF CHARGE, OR A 192K MEMORY BOARD FOR ONLY \$44.\*

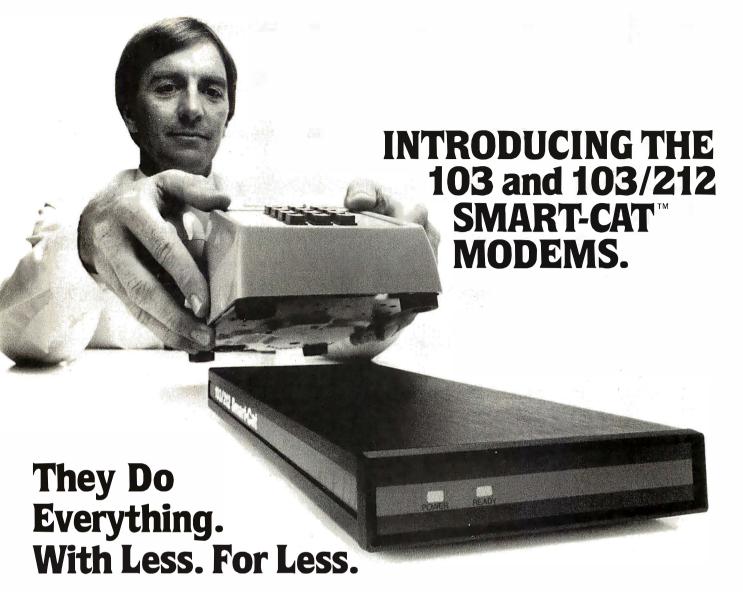
In order to receive a free 64K memory board or a 192K memory board for \$44, you must purchase a Quadboard with 256K installed by Quadram from an authorized Quadram dealer between December 1, 1982 and February 15, 1983.

To receive your memory board, send:

- (1) The **original** sales invoice showing dealer name, address, date purchased, and purchase price.
- (2) Coupon from newspaper or magazine (or rebate form available from dealer) completely filled in.
- (3) Proof of purchase (25**6**K label from Quadboard
- (4) Warranty card, showing warranty number and all information filled in.
- (5) All receipts, coupons, and proof of purchase forms must be mailed together in order to qualify for a memory board. Must be postmarked no later than March 1, 1983, and received by Quadram by March 15, 1983. Void where prohibited or taxed.
- \* Quadram suggested retail prices: 256K Quadboard—\$995 64K Memory Board socketed for up to 192K—\$350 192K Memory Board—\$595

| Name                |                  |                               |         |
|---------------------|------------------|-------------------------------|---------|
| Address             |                  |                               |         |
| City                | State            | Zip _                         |         |
| Please include ship | oing and handl   | ing charge                    | \$5.00  |
| ☐ 64K Memory Bo     | ard              |                               | FREE    |
| ☐ 192K Memory Bo    | oard             |                               | \$44.00 |
| <br>                |                  | ☐ MasterCard  Expiration Date | TOTAL   |
|                     | rohibited or tax | ed by law. Expires Febru      |         |





Take your pick. With either one, you'll get two very important advantages.

**First,** each is the best modem in its class. They do more, do it easier and do it in less space. The reason: our LSI technology is state-of-the-art. Our Smart-Cats

run better and cooler—and will for years.

**Second,** you can get your hands on either one of them right now. No waiting. Your local dealer has a shelf full.

The price is something else, too. Suggested retail:

The 103/212 Smart-Cat \$595. The 103 Smart-Cat \$249. See your dealer today and get yours. He does have a bunch, but it's not unlimited.

## **SMART-CAT MODEM FEATURES:**

- Built-in Dialer (Touch-Tone or Rotary) Auto Answer
  - Direct Connect
  - Analog & Digital Loopback Test
  - Extensive Software Command Set
  - Busy Detect (Allows Modem To Be Programmed To Redial)
  - 103 Smart-Cat Modem: 300 Baud, Full Duplex
  - 103/212 Smart-Cat Modem: 300 or 1200 Baud, Full Duplex



New Smart-Cat 103 and 103/212 modems.



18664 Oxnard Street, Tarzana, CA 91356

(800) 423-5419

In California: (213) 996-5060 Circle 476 on inquiry card.

## Look at what the best modem has been reduced to.

Our engineers have come up with some state-of-the-art LSI technology and a whole new modem.

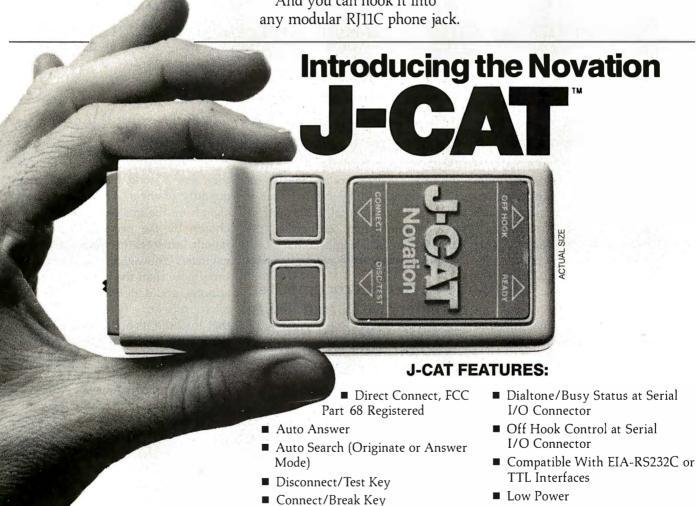
It's smaller. J-Cat is about 1/5th the size of an ordinary modem. Easy to stick-on, tuckin, put anywhere you want.

It's better. I-Cat does the things you need for professional performance. No fussing to get it into the right answer or originate mode; it does it automatically. LED's show you status; and audio "beeps" tell you when you reach a busy signal, detect a carrier, get a dial tone, etc.

And you can hook it into

It costs less. If you've shopped around, you know a modem with close to these features costs \$250 or more. Our LSI technology has let us do the right thing with the price, too. Suggested retail—\$149.

Smaller is definitely better. See your dealer. He has them right now.



■ Self-Test

Audio Line Status Indicator

**Novatio** 

(800) 423-5419

■ And it's from Novation, the world's

leader in personal communications.

In California: (213) 996-5060 Circle 477 on inquiry card.

# The IEEE Standard for the S-100 Bus

With industrywide standardization, manufacturers can independently design components that are compatible.

Mark Garetz Chairman, IEEE-696 Committee Compupro Division, Godbout Electronics Oakland Airport, CA 94614-0355

The microcomputer industry got started in late 1974 when a series of articles appeared in *Radio Electronics* magazine describing construction plans for a computer called the Mark 8. It was based on the first commercially available microprocessor, Intel's 8008. Today, the 8008 is obsolete. Nevertheless, the Mark 8 was the first microcomputer to be put within the reach of anyone but employees of a very large company, and response to the magazine articles was tremendous.

Just before the Mark 8 articles appeared, Intel had announced a greatly enhanced microprocessor, the 8080. Les Solomon, who was an editor at competing Popular Electronics, decided that his magazine should also publish a computer-construction article, but that it should use the newer 8080. He suggested to Ed Roberts, then the president of a small company called MITS, that Ed's company come up with a microcomputer kit. (MITS, or Micro Instrumentation and Telemetry Systems, usually specialized in electronics for model rocketry but had just published a successful scientific-calculator construction article.) Ed agreed and the Altair 8800 computer was born. The first Altair article appeared in the January 1975 issue of *Popular Electronics* and was an instant success. MITS figured that it might sell a grand total of 200 units. It received more than 200 orders the first day the article appeared!

Pioneer microcomputer builders MITS and IMSAI both chose to use a 100-pin bus to connect motherboard and daughter boards.

The Altair was a modular computer system, meaning that each of the computer's functional blocks was contained on one circuit board, or module. The circuit boards plugged into slots on a motherboard, which connected the various modules (daughter boards) together, with electrical connections made over a group of common lines called the bus. This type of system is described as busoriented. MITS called its bus the Altair Bus. The designers chose a connector for the motherboard that had

100 pins—not because of any design considerations but rather because they got a good buy on a surplus quantity of them. The layout of the signals on the bus seems as if it were chosen by the printed-circuit-board layout artist rather than a design engineer. The signals themselves are little more than the buffered control, address, and data lines from the 8080 microprocessor. (We are all lucky that Intel did its homework when designing the 8080's architecture.)

Being one of the first commercially available microcomputers, the Altair had many shortcomings. After all, the electronics community was low on the design curve of microprocessor systems. Learning from MITS's mistakes, designers in a company called IMSAI (IMS Associates Inc.) decided they could build a better version of the Altair and proceeded to do so. Luckily the IMSAI designers decided to "second source" the Altair and used the same bus in their computer, which was called the IMSAI 8080.

Meanwhile, many other small companies appeared, advertising add-on boards designed to work in both Altairs and IMSAIs. The bus was soon being called the Altair/IMSAI



## THE SOLUTION IS IN THE VISISERIES.

No matter what kind of problems you're trying to solve with an IBM Personal Computer, there's a program in the ever-expanding VisiSeries<sup>™</sup> line that will give you the solution. Faster, better, smarter.

Take our VisiCalc® program for the IBM Personal Computer. It's #1 in the business. Because it takes the work out of working with business numbers. The VisiCalc program is the powerful "electronic worksheet" that speeds planning and budgeting. You can ask "what if?" and see the answers immediately. So you can analyze the impact of decisions before you make them.

Our VisiTrend/Plot™ program makes it easy to analyze data and see the results in easy-to-understand charts and graphs.

With our VisiFile™ program you can organize, maintain and more effectively use the information your business needs.

Is a lot of your workday taken up

with scheduling projects and estimating costs? Our VisiSchedule™ program will help you do it better, with a lot less work.

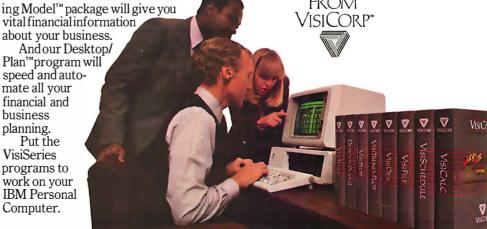
And for helping you manage your valuable time, organize your personal information, nothing could be of more value than our VisiDex® program. Our VisiCalc Business Forecast-

about your business. Andour Desktop/ Plan<sup>™</sup>program will speed and automate all your financial and business

planning. Put the VisiSeries programs to work on your IBM Personal Computer.

Get all the details from your VisiCorp retail computer dealer. Or write Customer Services, VisiCorp, 2895 Zanker Road, San Jose, CA 95134.

THE VISISERIES FOR THE IBM PERSONAL COMPUTER FROM VISICORP"



## **EMPLOYMENT** OPPORTUNITIES

## Project Manager

**HP3000** 

Standard & Poor's Corporation, the leader in the financial information products and services field has an opportunity for a proven Computer Professional to join its Technical Planning Group in New York City. This position will have multiproject management responsibility in our financial products development area and requires an assertive communicator who can inspire the confidence of management as well as the trust of subordinates.

Ideal candidates will have a solid HP 3000 programming back-ground in FORTRAN with IMAGE and successful full project life cycle management experience in developing financial systems. A bachelor's degree in a quantitative discipline is essential; an advanced degree is preferred.

Position is located in New York City and provides relocation assistance.

We offer a highly competitive salary, a state-of-the-art operating environment and comprehensive company benefits. For immediate consideration please forward a detailed resume, including salary history and requirement in confidence to: Employment Coordinator, Standard & Poor's Corporation, 25 Broadway, New York, N.Y. 10004

An Equal Opportunity Employer m/f



Standard & Poor's Corporation

For only . . .

your recruitment ad in this 4" space will reach 300,000 qualified readers just like yourself.

To place your ad call 212-997-2556, or send your copy to the address below.

RUIF

P.O. BOX 900, NY 10020

Let McGraw-Hill's Classified Ads Work For You

bus. Many other companies also produced bus-compatible computers and products, and each wanted to tack its name on as well. Names such as the Altair/IMSAI/Cromemco/Polymorphic/Processor Technology bus were not uncommon. The situation was clearly getting out of hand.

Roger Mellen, one of the principals of Cromemco, decided that a generic name was needed for the bus. His idea was to call it the Standard 100 bus, or S-100 for short (100 because it had 100 pins). The name caught on.

All the various manufacturers of S-100-compatible products had adhered to the bus pin arrangement fairly well. Only a few minor variations existed, and most of these were compatible additions using previously unused lines. However, although the various manufacturers used the same names for the signals, the timing of the signals could vary widely from manufacturer to manufacturer. This created many problems for people trying to get Board X to work with Board Y, etc. Something had to be done.

Bob Stewart, then chairman of the IEEE (Institute of Electrical and Electronics Engineers) Computer Standards Committee, suggested to George Morrow and Howard Fullmer (two noted S-100 designers) that they attempt to quantify the bus-timing relationships and other aspects of the bus and submit the bus for approval as an IEEE standard. The IEEE thought it was a good idea, and so did George and Howard, so a task number was assigned to the effort and a working group was formed to draft the standard. The task number was 696, and the standard will be known as IEEE

The working group prepared a preliminary draft and passed it around for comments to everyone working with the S-100 bus. John Walker of Marinchip Systems proposed a method for allowing 16-bit processors and memory to use the bus as well as 8-bit processors. David Gustavson proposed a scheme that would allow up to 16 DMA (direct memory access) devices to exist on the bus at any one time. A few new signals were proposed by Kels Elmquist of Ithaca In-

## GIFFORD COMPUTER SYSTEMS Multi-user computers that keep pace with business and technology.

## Not all computers can lead your business into the future.

Buying a multi-user computer system is a big investment. In time, training, and money. So you'd better choose a system that won't become obsolete.

Circle 183 on inquiry card.

### HARDWARE

8 MHZ 16 bit (8088) CPU 6 MHZ 8 bit (8085) CPU Up to 1 megabyte 10 MHZ static RAM 2.4 Megabytes of IBM compatible 8 inch

floppy disk storage Up to 80 Megabytes Winchester disk storage 20 slot IEEE 696/S-100 bus 9 RS-232C serial ports





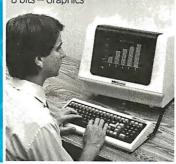
### SOFTWARE

MP/M™8-16™ including: CP/M-80™ CP/M-86™ dBASE II™ Data Base Management SuperCalc™ Financial Planning WordStar™Word Processing (optional)

8 bits - Word processing







You can begin your investment with a single user installation. Then, you can add up to 6 more terminals as your business grows. And you can add more memory as you need it.

## It does the job of two generations of computers at the same time.

With a Gifford Computer System you can use any of the thousands of 8 bit CP/M<sup>®</sup> programs available. And any of the faster 16 bit CP/M programs, too. If you're using

CP/M already, your investment in training, software and data is protected

Our systems are designed with your future in mind. With our bus-based system, as new technology becomes available it can be integrated into your computer at an affordable priceprotecting your hardware investment.

## You get all the support you'll ever need.

We have centers in San Francisco and Los Angeles, with complete demonstration and support facilities. Call now for a demonstration.

### Gifford Computer Systems. We're in business for your future.

MP/M 8-16 is a proprietary implementa-tion of MP/M-86 and was configured for CompuPro by G&G Engineering CP/M and MP/M are registered trademarks of Digi-tal Research SuperCalc is a trademark of Sorcim WordStar is a trademark of MicroPro International Corp. dBASEI is a trademark of Ashton-Tate. CompuPro is a trademark of Godbout Electronics

Gifford Computer Systems is an authorized CompuPro Systems Center.



A division of

GSG ENGINEERING

1922 Republic Avender San Leandro, CA 94577 (415) 895-0798 1922 Republic Avenue

City State.

## A Quick Reference to the IEEE-696 Bus Layout

Here is a guide to the IEEE-696 bus layout for easy reference. The letters RFU stand for "reserved for future use"; the IEEE committee may assign signals to these pins at some future date. The letters NDEF mean "not defined"; these pins are available to be assigned signals by manufacturers, a procedure that requires notifying the committee and providing full documentation for the users. The asterisk (\*) indicates a negative-true signal; note that some signals are not necessarily true or false, although the lack of an asterisk in their name might imply positive-true sense.

| Pin                              | Signal<br>Name                                                                      |                  | Ori              | gin                      |          | Pin                         | Signal<br>Name                                                   |                  | Ori              | igin                            |                                               |
|----------------------------------|-------------------------------------------------------------------------------------|------------------|------------------|--------------------------|----------|-----------------------------|------------------------------------------------------------------|------------------|------------------|---------------------------------|-----------------------------------------------|
|                                  |                                                                                     | master           | slave            | master<br>or slave       | anywhere |                             |                                                                  | master           | slave            | master<br>or slave              | anywhere                                      |
| 1<br>2<br>3<br>4<br>5            | + 8 V<br>+ 16 V<br>XRDY<br>VI0*<br>VI1*                                             | 102              | X<br>X<br>X      |                          | X        | 51<br>52<br>53<br>54<br>55  | + 8 V<br>- 16 V<br>0 V<br>SLAVE CLR*<br>TMA0*                    | ×                |                  |                                 | X<br>X<br>X                                   |
| 6<br>7<br>8<br>9<br>10           | VI2*<br>VI3*<br>VI4*<br>VI5*<br>VI6*                                                |                  | X<br>X<br>X<br>X |                          |          | 56<br>57<br>58<br>59<br>60  | TMA1*<br>TMA2*<br>sXTRQ*<br>A19<br>SIXTN*                        | X<br>X<br>X      | X                |                                 | Anthon San San San San San San San San San Sa |
| 11<br>12<br>13<br>14<br>15       | VI7*<br>NMI*<br>PWRFAIL*<br>TMA3*<br>A18                                            | ××               | X                |                          | X        | 61<br>62<br>63<br>64<br>65  | A20<br>A21<br>A22<br>A23<br>NDEF                                 | X<br>X<br>X      |                  |                                 |                                               |
| 16<br>17<br>18<br>19<br>20       | A16<br>A17<br>SDSB*<br>CDSB*                                                        | X<br>X<br>X      |                  |                          | ×        | 66<br>67<br>68<br>69<br>70  | NDEF<br>PHANTOM*<br>MWRT<br>RFU<br>0 V                           |                  |                  | X                               | X                                             |
| 21<br>22<br>23<br>24<br>25       | NDEF<br>ADSB*<br>DODSB*<br>\$\phi\$<br>pSTVAL*                                      | X<br>X<br>X      |                  |                          |          | 71<br>72<br>73<br>74<br>75  | RFU<br>RDY<br>INT*<br>HOLD*<br>RESET*                            | ×                | ×                |                                 | X                                             |
| 26<br>27<br>28<br>29<br>30       | pHLDA<br>RFU<br>RFU<br>A5<br>A4                                                     | ×                |                  |                          |          | 76<br>77<br>78<br>79<br>80  | pSYNC<br>pWR*<br>pDBIN*<br>A0<br>A1                              | X<br>X<br>X<br>X |                  |                                 | 1                                             |
| 31<br>32<br>33<br>34<br>35       | A3<br>A15<br>A12<br>A9<br>DO1 (or ED1)                                              | X<br>X<br>X<br>X |                  | (X)                      | o di     | 81<br>82<br>83<br>84<br>85  | A2 , · A6 A7 A8 A13                                              | X<br>X<br>X<br>X |                  |                                 |                                               |
| 36<br>37<br>38<br>39<br>40<br>41 | DO0 (or ED0)<br>A10<br>DO4 (or ED4)<br>DO5 (or ED5)<br>DO6 (or ED6)<br>D12 (or OD2) | X<br>X<br>X<br>X |                  | (X)<br>(X)<br>(X)<br>(X) |          | 86<br>87<br>88<br>89<br>90  | A14<br>A11<br>DO2 (or ED2)<br>DO3 (or ED3)<br>DO7 (or ED7)       | X<br>X<br>X<br>X | V                | (X)<br>(X)<br>(X)               |                                               |
| 42<br>43<br>44<br>45<br>46       | DI3 (or OD3)<br>DI7 (or OD7)<br>sM1<br>sOUT                                         | X<br>X           | X<br>X<br>X      | (X)<br>(X)<br>(X)        |          | 92<br>93<br>94<br>95        | DI4 (or OD4) DI5 (or OD5) DI6 (or OD6) DI1 (or OD1) DI0 (or OD0) |                  | X<br>X<br>X<br>X | (X)<br>(X)<br>(X)<br>(X)<br>(X) |                                               |
| 47<br>48<br>49<br>50             | SINP<br>SMEMR<br>SHLTA<br>CLOCK<br>0 V                                              | ×                |                  |                          | ×        | 96<br>97<br>98<br>99<br>100 | sINTA<br>sWO*<br>ERROR*<br>POC*<br>0 V                           | X                | X                | X<br>X                          |                                               |



## **A** Database That Catches Mistakes? That's My Qbase.

Presenting Qbase,™ The Personal Database And Reporting System That Prevents Mistakes Before They Become Expensive. Just \$189 Complete.

There's no question that databases are useful tools for storing and retrieving information. Thousands of professionals use databases to monitor inventory, manage mail lists, record fixed assets, and keep track of personnel records.

So what's the problem?

## NOT ALL DATABASES ARE CREATED EQUAL

In hundreds of personal computer applications, users agree on one thing: there's nothing more aggravating than a database that lacks all the features to do the job that needs to get done.

And of all the database features used by experienced users, none is more often called for than data entry checking.

Why is that so important? Because experienced users know how many aggravating hours they can waste fixing mistakes that their database should have caught.

For Use With IBM PC and APPLE II

Fortunately there's Qbase, the only full-feature database in its price range that can substantially reduce common input errors.

## PREVENT DATABASE CONTAMINATION

Qbase uses sophisticated data checking features normally found on large systems. Functions that catch invalid alphanumeric sequences. Check for minimum/ maximum number lengths. Enforce data inputs where mandatory. Require date formats. Allow for yes/no replies. And verify that alphabetic and numeric values lie within pre-specified ranges.

And then we added an embedded calculator that automatically computes taxes and commissions. It even accepts credits and debits against balances due.

And reports? Obase includes a powerful reporting facility—at no extra charge. With it, you can produce sorted reports with sub-totals AND totals. Moreover, all report definitions are fully documented and stored in a library. So there's no guessing which report does what. Just call for your favorite report and it's done.

Write or call for your free brochure, "How To Keep Errors Out Of A Database." See for yourself what data checking can do to save you time and aggravation. Write to:

Applied Software Technology 14125 Capri Drive

Los Gatos, CA 95030

or call 408/370-2662

| NAME    |       |     |
|---------|-------|-----|
| COMPANY |       | Ξ   |
| ADDRESS |       |     |
| CITY    | STATE | ZIP |



Circle 29 on inquiry card. BYTE February 1983



tersystems (then known as Ithaca Audio). The second draft of the document that came out of the working group contained important additions and enhancements to the original Altair bus but still retained a significant level of compatibility with older designs. (The original Altair processor board still conforms to today's standard.)

This second draft was published in the July 1979 issue of the IEEE's Computer magazine for public comment. There were lots of comments, mostly favorable. The 1979 draft needed lots of work. Definitions were unclear in places, and many additional parameters needed to be specified. The committee grew; George resigned as chairman, and Howard took over. Meetings were sporadic, but heated debates occurred on some issues, preventing other work from being accomplished. Howard called for a final meeting to occur on June 30, 1981, at 10:30 a.m. All final comments on the draft were to be submitted in writing prior to that date.

More than 20 people were present at that meeting from all parts of the country. The meeting began at 10:30 a.m. and ended around 11:30 that evening. All the issues had been resolved to everyone's satisfaction. I volunteered the services of Compupro (the company I work for, in Oakland, California) to produce a third draft of the standard, incorporating all the changes approved at the meeting.

Now the activities of the committee entered a period of dormancy. Howard took a long time in organizing his notes of the various changes; he was losing interest in chairing the committee (having moved out of the S-1.00 business some time before) and so turned the chairmanship over to me. With the help of Bob Davis, I prepared the third draft of the standard and sent it out to the members of the working group for comment. Changes were still necessary. After spending many hours on the phone to various committee members, draft 5 was completed and sent out for a vote for final approval by the working group. It passed with only one dissenting vote.

The next step was to submit it to the Microprocessor Standards Committee of the IEEE for approval. It passed unanimously. Next the draft was submitted to the Computer Standards Committee and was accepted. The last hurdle was the IEEE Standards Board, which passed the draft on December 9, 1982. With that vote, IEEE 696 became a bona fide IEEE standard.

## Technical Features of the Bus

The IEEE-696/S-100 bus is one of the highest-performance buses in existence today. It supports both 8- and 16-bit processors, up to 16 megabytes of memory, and 64K I/O (input/output) ports. Almost every type of processor imaginable, from the 8080 to the latest Intel iAPX 286, is available for the bus. There are more than 100 active manufacturers of products for the bus and many more than 500 different circuit cards available.

IEEE-696/S-100 systems consist of anywhere from 4 to 22 slots. Each system must contain a permanent bus master, which is usually the processor board. The system will have some memory and I/O boards called slaves. In addition to the permanent master, the system may contain up to 16 temporary masters, DMA-like devices, such as disk controllers or secondary processors. As many as 16 temporary masters may exist because each is assigned a priority number. If more than one temporary master requests the bus at the same time, the one with the highest priority number will take precedence, and the lower priority master will have to wait its turn. (This process is called arbitration.)

Because a temporary master can perform any type of cycle when it gets control of the bus (not just a memory cycle), the committee deemed the term DMA inappropriate and substituted the term TMA (for temporary master access). Four new lines were added to the bus to implement this arbitration scheme, TMA0\* through TMA3\* (the style of the standard defines any signal with an asterisk suffix as negative-true, a style I will use in this article). Each temporary master asserts its priority on

# GOOD NEWS

Have you put aside buying a color monitor because it's too expensive?

But, have you looked at the new TAXAN RGBvision color monitor?

Would you be excited at a suggested retail price of \$399.00 for the RGBvision I, and \$599 for the RGBvision II?







## DO WE HAVE GOOD NEWS FOR YOU!

For those low prices, you can have:

- ▼Full compatibility with Apple III and IBM PC without interface modules
- Compatible with Apple II through the TAXAN "RGB-II" card
- RGBvision I medium resolution · 38O(H) lines
- ™RGBvision II high resolution 510(H) lines
- Unlimited colors through linear amplifier video circuit and 16 colors for Apple III and IBM PC
  - ☑ 12-inch, 90° deflection CRT display

Can you really afford to turn all that down without looking at the TAXAN RGBvision monitors? See your local dealer for a demonstration.



TAXAN 12" green phosphor monitor, model KGl2N, teatures an 800 line resolution at center, 2000 character display.



TAXAN

TSK ELECTRONICS CORPORATION

1524 Highland Avenue Duarte, California 91010 A subsidiary of Kaga Denshi

Apple II and III are trademarks of Apple Computer, Inc. IBM PC is a trademark of International Business Machines, Inc.

# QUADBOARD

# THE FIRST AND ONLY BOARD YOUR IBM PC MAY EVER NEED.

Your IBM personal computer is a very versatile piece of equipment. Perhaps more versatile than you realize. New applications and functions are being developed every day. Now with Quadboard

by Quadram you can keep your options open for tomorrow's technology. Following in the tradition of Quadram Quality, four of Quadram's best selling IBM boards have been combined into one board. Your remaining slots will be left free and available to accommodate future expansion needs and uses which you may not even be able to contemplate today.



## PROVEN DESIGN.

Quadram has been shipping IBM boards with each of the Quadboard functions on separate boards since December, 1981. They are still available as separates (including a Dual Port Async Board) for those who desire a quality board but do not need to keep slots open for future expansion. And they all come with a one year warranty from the leader in technology applications.

## 256K MEMORY EXPANSION.

Socketed and expandable in 64K increments to 256K, full parity generation and checking are standard. A Quadboard exclusive feature allows parity to be switch disabled to avoid lock-up upon error detection. The dip switches also allow it to be addressed starting on any 64K block so that it takes up only as much as it has memory installed. Memory access and cycle time naturally meet all IBM specifications.

## CLOCK/CALENDAR.

Quadboard eliminates the hassle of manually inputting the date on system boot-up by providing for the clock and all software routines necessary for inserting the appropriate programs on your diskettes. The internal computer clock is automatically set for compatibility with most software routines which utilize clock functions. On-board battery keeps the clock running when the computer is off.

# BYQUADRAM

## **ALL ON ONE BOARD**

Now you can utilize all the PC's capacity with Quadram's extremely flexible configurations. And it's totally compatible with IBM hardware, operating systems, and high level languages. It's a full-size board that can be inserted into any free system slot and it even includes a card edge guide for securely mounting the card in place.

## **SOFTWARE TOO!**

With Quadboard you receive not only hardware but extensive software at no extra cost. Diagnostics, utilities, and Quad-RAM drive software for simulating a floppy drive in memory (a super-fast SOLID STATE DISK!) are all part of the Quadboard package.



## PARALLEL PRINTER I/O.

A 16 pin header on Quadboard is used for inserting a short cable containing a standard DB25 connector. The connector is then mounted in the knock-out hole located in the center of the PC backplane. The parallel port can be switch disabled or addressed as Printer 1 or 2. No conflict exists with the standard parallel port on the Monochrome board. The internal cable, connector and hardware are all included.

## ASYNCHRONOUS (RS232) COMMUNICATION ADAPTER.

Using the same chip as that on the IBM ASYNC board, the device is software programmable for baud rate, character, stop, and parity bits. A male DB25 connector located on the back connector is identical to that on the IBM Async Adapter. The adapter is used for connecting modems, printers (many letter quality printers require RS232), and other serial devices. Switches allow the port to be configured as COM1 or COM2 and the board fully supports IBM Communications Software.

## **INCREDIBLE PRICE!**

Priced at \$595 with 64K installed, \$775 with 128K, \$895 with 192K and \$995 with 256K.

## ASK YOUR DEALER.

All products are sold through local personal computer dealers. If yours does not stock Quadram, please ask him to call us at (404) 923-6666.



4357 Park Drive/Norcross, Ga. 30093 Circle 353 on inquiry card. these lines, while simultaneously evaluating whether another master asserting a higher priority is on the line. If a temporary master sees that its priority is not the highest, it defers to the higher priority.

Formerly, memory slaves responded to only 16 address bits (giving the system a total memory capacity of 64K bytes). The new standard defines an additional 8 address lines, called the *extended address bus*. Now the memory capacity of the system is 16 megabytes.

In the past, I/O slaves responded to only 8 address bits, giving a total of 256 I/O port locations. Now 16 address lines may be used, upping the number to 64K I/O ports.

## 8- and 16-Bit Operation

One of the more significant changes to the original bus was the addition of a mechanism for performing 16-bit data transfers between masters and slaves. To explain this, first we need to explore how the bus does 8-bit transfers.

The IEEE 696 has two 8-bit data buses. For 8-bit transfers, the DO (data-out) bus carries data from the master to a slave, and the DI (data-in) bus carries data from a slave to a master. Because data always flows in one direction, these buses are called *unidirectional*. For 16-bit transfers, these two buses become *bidirectional*, meaning that data can flow in or out, depending on the type of cycle in progress, and are combined so that two 8-bit buses are now capable of transmitting or receiving 16 bits of data.

To accomplish this bidirectional flow, two new lines were added to the bus. They are sXTRQ\* (sixteen request) and SIXTN\* (sixteen acknowledge). Here's how the mechanism works: If a master is capable of conducting a 16-bit transfer and desires to do so (16-bit processors don't always want to transfer 16 bits at a time), it will send the signal sXTRQ\*, telling the addressed slave that a 16-bit transfer is requested. If the slave is capable of 16-bit operation, it will respond by asserting the SIXTN\*

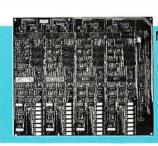
line. The master will look at the SIXTN\* signal and, if the signal is true, will conduct a 16-bit-wide transfer. If the master sends the signal sXTRQ\* and the slave is not capable of 16-bit transfers, SIXTN\* will not be asserted. The master can then do one of two things. The desired response would be to perform the 16-bit transfer as two sequential 8-bit transfers, called *byte-serial* transfers. The other option is to assert the ERROR\* line and transfer control to some error-recovery routine.

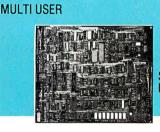
This protocol is completely compatible with older 8-bit slaves. Eightbit slaves will not have any circuitry for driving the SIXTN\* line, and because SIXTN\* is active low, a 16-bit master will properly assume that 16-bit transfers are not possible. This also allows for both 8- and 16-bit slaves to be mixed in a system, assuming the master has "byte-serializer" circuitry.

This basic 16-bit transfer protocol was agreed to by everyone in the working group very early on, but

## SB-80/4 The affordable singleboard microcomputer with multi-user, multi-tasking muscle and brains.







SINGLE USER

SB-80/4 A complete microsystem for the user who demands speed and storage capacity in single or multi-user applications. Choose our true CP/M® compatible MuLtI/NET™ or TurboDOS™ operating system.

Single Board Technology This multiprocessor board allows each user (up to four) a dedicated Z80A microprocessor and 64K of RAM. The master-slave architecture, residing in the same enclosure, supervises all user requests for storage and peripherals through four channel DMA.

Memory and Disk Storage 320K of 200ns dynamic RAM combined with five (5) Z80A microprocessors pro-

vides the hardware to independently multi-task the operation. On board interface for Winchester type disk controller allows from 5 to 104 megabytes of storage for applications that require large database files and records. The four parallel and six serial ports provide the muscle to support numerous peripherals.

**Software** InfoSoft's MuLtI/NET provides the most efficient multi-processor operating system. Software 2000 Inc.'s TurboDOS offers speed and performance.

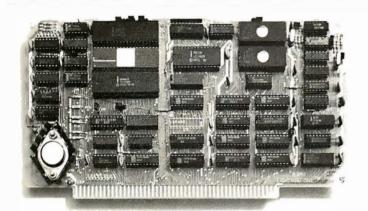
Dealer and OEM inquiries are welcome. Nationwide field service through INDESERV.

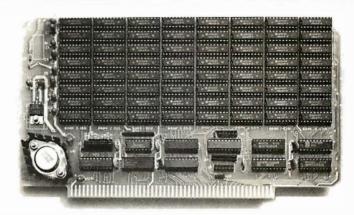


Colonial Data Services Corp., 105 Sanford Street, Hamden, Conn. 06514 • (203) 288-2524 • Telex: 956014

"MuLtI/NET is a Trademark of InfoSoft Systems, Inc. "CP/M is a registered trademark of Digital Research, Inc. "TurboDOS is a trademark of Software 2000 Inc.

# THE ULTIMATE COMBINATION





## Lightning One\* and RAM67

If you have an application problem you can't solve with an eight bit system, try our 16 bit combination. There is no faster combination currently available on the S100 bus and we have benchmarks to prove it.

The Lightning One\* is a state-of-the-art, 8086 S100 bus CPU board. The high speed 8087 floating point processor adds the numeric processing capability of large mini computers and the 8089 I/O processor adds I/O channel capability only found on large mainframes.

RAM67 is our high speed low power CMOS STATIC RAM board. 128K bytes of battery backupable memory are packed on one board. Speedy? Our RAM67 has over 100 ns margin when used with our 10 MHz *Lightning One* CPU Board.

Call or write for more information on The Ultimate Combination: Lightning One and RAM67. Lomas Data Products offers

a full line of quality \$100 bus products . . . systems, software and other "no-nonsense" boards.

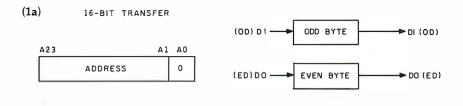
LOMAS DATA PRODUCTS, INC. 

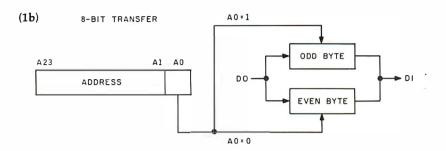
66 Hopkinton Rd. 
Westboro, Massachusetts 01581



(617) 366-6434

Dealer and OEM inquiries are invited.





**Figure 1:** Data transfers as performed according to the IEEE-696 standard. In figure 1a, a 16-bit transfer is shown using all of the available data lines. Data whose least-significant address bit is 0 is considered even, while data whose least-significant address bit is 1 is considered odd. Figure 1b shows how the odd and even bytes are employed during an 8-bit-wide transfer of 16-bit data (called a byte-serial transfer).

heated debate took place about what byte should be where (i.e., should the low-order byte be transferred on the DI or the DO bus?).

The problem arises because different microprocessors do things completely differently. For example, the 8080-type 8-bit processors always store 16-bit values with the low-order byte first. So does Intel's 8086/88 family of processors. But along came Motorola's 68000, which stores the high-order byte first. The working group was faced with the problem of deciding which to favor. Naturally, there were proponents of both in the working group.

The group's final solution was both clever and unique in that it made everybody happy. The first published draft had renamed the lines of the DI and DO buses DATA0 through DATA15 during 16-bit transfers. DATA0 through DATA7 were called the low byte (and were transferred on the DO bus), and DATA8 through DATA15 were called the high byte (and were transferred on the DI bus). These signal names and byte designations carried an implied significance: DATA0 through DATA7 were lower than DATA8 through DATA15, and "low" is clearly lower than "high."

The committee decided to rename the signals to be free of this implication and be concerned only with making sure that bytes and words always got read or written in a consistent manner.

The low byte became the even byte, and the high byte became the odd byte. The even-byte lines are now called ED7 through ED0 (ED for even data), and the odd-byte lines are now called OD7 through OD0 (OD for odd data). Even data is transferred on the DO bus, and odd data is transferred on the DI bus.

Where did even and odd come from? Well, it has to do with how the bytes would be read or written as a byte (i.e., in 8-bit mode). During 16-bit transfers, address line A0 is always low. During 8-bit transfers, if A0 is low, that byte is an even byte (because any address where A0 is low would be even). Conversely, if A0 is high, that byte is an odd byte. It is up to the processor-card designer to ensure that data read or written 16 bits at a time has the "even" data on the ED lines (DO bus) and "odd" data on the OD lines (DI bus).

Figure 1 is a block diagram of where the bytes go for 8- and 16-bit cycles. Figure 2 shows a block

diagram of how a typical slave would be set up to handle 8- and 16-bit transfers. In figure 2, the signal SEL selects either the A input (for 16-bit transfers) or the B input (for 8-bit transfers). The control signals employed must obey the following logic equations:

$$\begin{array}{l} A \, = \, 16_{RD} \, + \, (\, 8_{RD} \, \bullet \, A0 \, ) \\ B \, = \, 8_{RD} \, \bullet \, \overline{A0} \\ C \, = \, 16_{RD} \\ E_{WR} \, = \, 16_{WR} \, + \, (\, 8_{WR} \, \bullet \, \overline{A0} \, ) \\ O_{WR} \, = \, 16_{WR} \, + \, (\, 8_{WR} \, \bullet \, A0 \, ) \end{array}$$

where:

$$16_{RD} = \text{device select} \cdot \\ \text{sXTRQ*} \cdot \text{pDBIN}$$

$$8_{RD} = \frac{\text{device select}}{\text{sXTRQ*}} \cdot \text{pDBIN}$$

$$16_{WR} = \text{device select} \cdot \\ \text{sXTRQ*} \cdot \text{pWR*}$$

$$8_{WR} = \frac{\text{device select}}{\text{sXTRQ*}} \cdot \text{pWR*}$$

Designers should take note that the state of A0 as shown in these new diagrams is the opposite of what is shown in the 1979 draft. It has been changed since the 1979 draft and is correctly shown in figures 1 and 2.

It is important to realize that this new terminology does not change how 16-bit transfers occur on the bus but just changes the way we think about them.

## Other Technical Changes

The committee debated whether or not the PHANTOM\* line (pin 67, see table 1, pages 288 and 292) should disable memory slaves for both read and write operations, or just read operations. We decided to require memory slaves to be disabled for both read and write cycles during PHAN-TOM\*. The timing of PHANTOM\* was also specified as not occurring later than 30 ns (nanoseconds) before a read or write strobe and not going away until at least 30 ns after the read or write strobe goes away. The committee specified this timing to ensure that false reads or writes do not occur on memory slaves. In addition, the committee required that all normal memory slaves (as opposed to PHANTOM\* slaves) have the capa-

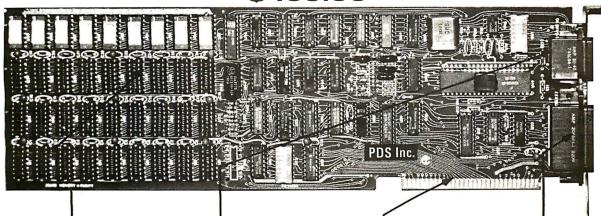


## THE TRUMP CARD FOR IBM PC



PDS UNIVERSAL introduces TRUMP CARD IBM\* compatible, 256K RAM, + serial I/O + game I/O board.

\$499.00



### **256K RAM**

A 64K to 256K parity checking RAM is fully socketed for easy memory expansion. The memory address is switch selectible, using up only the required memory space.

### GAME I/O

Interface consisting of two joy-sticks and four switch inputs are IBM BASIC compatible. A standard GAME I/O DB15 connector provides connection to the rear plate of the IBM computer.

## GOLD IBM

Gold connectors as well as glass epoxy PCB will provide years of reliable service, with all hardware interface meeting the IBM specification.

### ASYNCHRONOUS COMMUNICATION

A RS232 and 20Ma (TTY) interface supports software programable bauli rates, partly, stop bits, and character. Modem and serial printer are fully supported by the IBM communication software. A standard DB25 connector allows for the easy connection to serial devices.

TRUMP CARD 1 15 the Most TRUMP CARD-S COMES COM THUMP CARUS COMES COMPANY ASYNC TRUMP CARD TIS the most card memory C. The card memory C. The cost effective memory IBM-PC. The plete with 256K Ram. Asynco.

plete with 256K Ram. Asynco.

plete with 256K Ram. Asynco.

plete with 256K Ram. Asynco.

plete with 256K Ram. Asynco.

parallel 256K Ram. Asynco.

plete with 256K Ram. Asynco.

parallel 256K Ram. Asynco.

plete with cost errective memory card 2 features available for your ith virth armine to your ith your ith virth armine to your ith virth armine t FUMP SAMU A ASWICHONUS 512K Ram and an Aswich on one Trump Card I comes completes and a with 256 K Ram, a conial north and a with 256 K Ram, a conial north and a 72K Ham and an Asynchronus (RS-232C) Serial Port on card interface card THE ESECUL SENSI PORT OF ORE CARD TRUMP CARD Fame In bours for only Turly populated interrace for your IBM-PC.... reservo borgini hais

## THE QUALITY IS EXCELLENT AND PRICES MATCH THE ECONOMY.

The Trump Cards Are Available At CompuShack Stores Around The World, Or Any Fine Computer Store In Your Area

☆IBM is a trademark of IBM Corp.

For Further Information Contact:

## PDS Universal, Inc.

2630 Walnut Ave., Suite G Tustin, CA 92680 (714) 730-6772 Telex 18-3511 answer back CSMA

Circle 347 on inquiry card.

BYTE February 1983 285

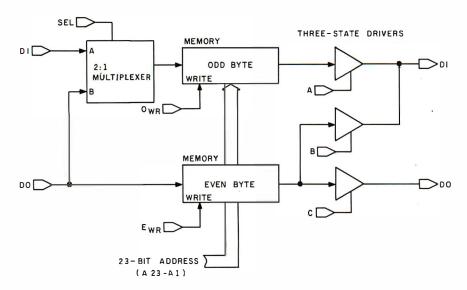


Figure 2: Block diagram of the circuitry needed by S-100 bus slaves for byte and word transfers under the IEEE-696 standard.

bility of being disabled in response to a PHANTOM\* signal.

A new signal was defined in the 1979 draft called PWRFAIL\*, which should go low 16 ms (milliseconds) before the power goes away. (Note that this time is shorter than the time originally published.) A problem was discovered in actual implementations of this signal: when power momentarily dips just low enough to cause the PWRFAIL\* signal to be activated but doesn't actually go away, PWR-FAIL\* returns high again. But the system is now waiting for a POC\*

(power-on-clear) signal that won't ever happen because power never went low enough.

The solution to this was to specify that the rising edge of PWRFAIL\* (which will occur at the end of the power dip) shall cause POC\* to be asserted. We chose the rising edge rather than just the low level of PWR-FAIL\* because otherwise no time would be available to execute a power-fail routine.

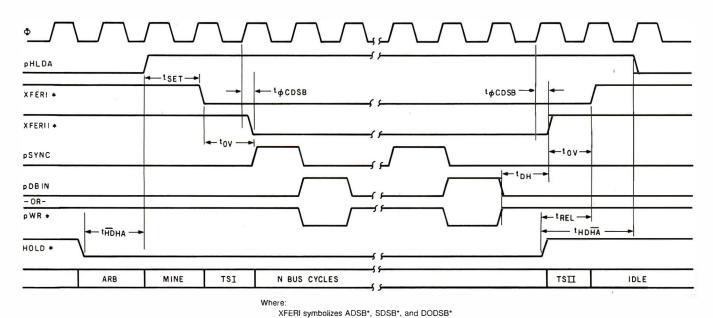
The TMA cycles now have more specific timing associated with them. In general, the tHDHA terms were added to ensure adequate time for TMA arbitration to take place and to ensure that the transfer occurs in a "glitch-free" manner. Figure 3 and table 2 show the new timing relationships. Figure 4 and table 3 show basic bus timing as it appears in the new standard.

We made one major mechanical change to the standard in order to make room for an optional 10-inchhigh board. This "double-height" board allows much more circuitry per board, which will reduce costs and increase system performance. Of course, these boards will not fit into most existing system cabinets, but it is just a matter of time before doubleheight boxes appear. In the meantime, all manufacturers of doubleheight boards must clearly state that a board is double-height in all product literature and advertisements.

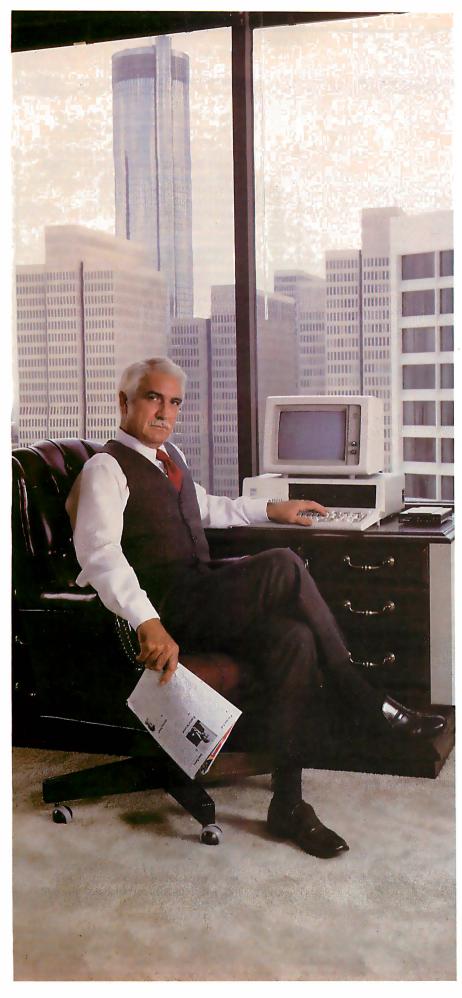
That's about it for technical changes to the standard draft. The other minor changes are not really significant. As was mentioned earlier in this article, they are mostly to clear up ambiguities for the sake of designers.

## Why Use the IEEE-696/S-100 Bus?

The IEEE-696/S-100 bus offers many advantages over single-board computers, the biggest of which is that the IEEE-696/S-100 systems are



XFERII symbolizes CDSB\* **Figure 3:** Diagram of the timing relationships for temporary-master access to the bus.



# Now I can get the information I need. From anywhere. Immediately.

To do business. I need information from a lot of places.

Sales figures from Cincinnati. Production costs from Philadelphia. Personnel levels from our administrative offices three blocks away.

And — sometimes — I need up to the minute market prices from The Source. Whatever I need, I get it. Immediately. That means that I don't waste time waiting. And I don't have to make decisions based on old information. Even if it's just a day old.

Information from anywhere. Immediately. With



Crosstalk allows your CP/M or MS-DOS based computer system to access almost any dial-up computer, capture and store the data, and transfer files between any two Crosstalk systems with complete error checking. Even when disk formats are incompatible.

To get your information, Crosstalk can automatically dial any dial-up system, capture on-line data for analysis off-line.

Crosstalk saves you and your computers time. It saves you money. And, best of all, it gets you the information that you need, when you need it. Ask your local dealer about it.

# Now available for IBM PC



1845 The Exchange Suite 205 Atlanta, GA 30339 (404) 952-0267

# DEALER INQUIRES WELCOME

CROSSTALK is a trademark of Microstuf, Inc. CP/M is a registered trademark of Digital Research Inc. The Source is a servicemark of Source Telecomputing, Corp. a subsidiary of The Readers Digest Association, Inc. MS-DOS is a trademark of Microsoft, Inc.

# FOR TRS-80 MODEL I OR III IBM PERSONAL COMPUTER

- MORE SPEED 10-20 times faster than interpreted BASIC.
- MORE ROOM Wery compact compiled code plus VIRTUAL MEMORY makes your RAM act larger. Variable number of block buffers. 31-char.-unique wordnames use only 4 bytes in header!
- MORE INSTRUCTIONS
  Add YOUR commands to lts 79-STANDARD-plus
  instruction set!
  Far more complete than most Forths: single & double
  precision, arrays, string-handling, clock, graphics (IBM
  low-res, gives BrW and 16 color or 200 tint color display).
- MORE EASE
  Excellent full-screen Editor, structured & modular programming
  Word search utility
  THE NOTE/PAD letter writer
  Optimized for your TRS-80 or IBM with keyboard repeats, upper/lower case display driver, full ASCII.
- MORE POWER MORE POWER
  Forth operating system
  Concurrent Interpreter AND Compiler
  VIRTUAL I/O for video and printer, disk and tape
  (10-Megabyte hard disk available)
  Full 8080 or 8088 Assembler aboard
  (280 Assembler also available for TRS-80)
  Intermix 35- to 80-track disk drives
  IBM can read, write and run M.3 disks
  M.3 can read, write and run M.1 disks



# THE PROFESSIONAL FORTH SYSTEM FOR TRS-80 & IBM PC

(Thousands of systems in use)

### AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided MMSFORTH Newsletter

Many demo programs aboard MMSFORTH User Groups

Inexpensive upgrades to latest version Programming staff can provide advice, modifications and

custom programs, to fit YOUR needs.

MMSFORTH UTILITIES DISKETTE: includes FLOATING POINT MATH (BASIC ROM routines plus Complex numbers, Rectangular-Polar coordinate conversions, Degrees mode, more); a powerful CROSS-REFERENCER to list Forth words by block and line; plus (TRS-80) a full Forth-style Z80 assembler or (IBM PC/color) Turtle Graphics (requires MMSFORTH V2.0, 1 drive & 32K RAM).....\$39.95

FORTHCOM: communications package provides RS-232 driver, dumb terminal mode, transfer of files or FORTH blocks. 

THE DATAHANDLER: a very fast database management system operable by non-programmers (requires MMSFORTH V2.0, 1 drive & 32K RAM) ......\$59.95°

FORTHWRITE: fast, powerful word processor w/easy keystrokes, Help screens, manual & demo files. Full proportional w/tabs, outdenting. Include other blocks, documents, key-board inputs, & DATAHANDLER fields—Ideal for form letters (requires MMSFORTH V2.0, 2 drives & 48K RAM) . . . . \$175.00°

MMSFORTH GAMES DISKETTE: real-time graphics & board games w/source code. Includes BREAKFORTH, CRASH-FORTH, CRYPTOQUOTE, FREEWAY (TRS-80), OTHELLO & TICTACFORTH (requires MMSFORTH V2.0, 1 drive & 32K RAM) 

### Other MMSFORTH products under development

# FORTH BOOKS AVAILABLE

| MMSFORTH USERS MANUAL - w/o Appendices \$17.50°                                                           |
|-----------------------------------------------------------------------------------------------------------|
| STARTING FORTH - best!                                                                                    |
| THREADED INTERPRETIVE LANGUAGES - advanced, analysis of FORTH Internals                                   |
| PROGRAM DESIGN & CONSTRUCTION - intro. to structured programming, good for Forth                          |
| FORTH-79 STANDARD MANUAL - official reference to 79-STANDARD word set, etc                                |
| FORTH SPECIAL ISSUE, BYTE Magazine (Aug. 1980) - A collector's item for Forth users and beginners \$4.00° |

- ORDERING INFORMATION: Software prices include manuals and require signing of a single computer license for one-person support. Describe your hardware. Add \$2.00 S/H plus \$3.00 per MMSFORTH and \$1.00 per additional book, Mass. orders add 5% tax. Foreign orders add 26% UPS COD, VISA and M/C accepted; no unpaid purchase orders or refunds.

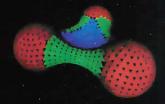
Send SASE for free MMSFORTH information. Good dealers sought.

Get MMSFORTH products from your computer dealer or

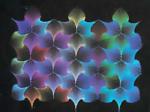
MILLER MICROCOMPUTER SERVICES 61 Lake Shore Road, Natick, MA 01760 (617) 653-6136

| Die           | O'I                                    | Activo          |                                                                                                                                                           |
|---------------|----------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pin<br>Number | Signal<br>(and Origin)                 | Active<br>Level | Description                                                                                                                                               |
| 1             | + 8 V (B)                              |                 | Instantaneous minimum greater than 7 V, instantaneous maximum less than 25 V, average                                                                     |
| 2             | + 16 V (B)                             |                 | maximum less than 11 V. Instantaneous minimum greater than 14.5 V, instantaneous maximum less than 35 V,                                                  |
| 3             | XRDY (S)                               | Н               | average maximum less than 21.5 V.  One of two ready inputs to the current bus master. The bus is ready when both these ready inputs are true. See pin 72. |
| 4             | VI0*(S)                                | L OC            | Vectored-interrupt line 0.                                                                                                                                |
| 5<br>6        | VI1*(S)<br>VI2*(S)                     | L OC            | Vectored-interrupt line 1. Vectored-interrupt line 2.                                                                                                     |
| 7             | VI3*(S)                                | L OC            | Vectored-interrupt line 3.                                                                                                                                |
| 8             | VI4*(S)                                | L OC            | Vectored-interrupt line 4.                                                                                                                                |
| 9             | VI5*(S)                                | L OC            | Vectored-interrupt line 5. Vectored-interrupt line 6.                                                                                                     |
| 10<br>11      | VI6*(S)<br>VI7*(S)                     | L OC            | Vectored-interrupt line 7.                                                                                                                                |
| 12            | NMI*(S)                                | L OC            | Nonmaskable interrupt.                                                                                                                                    |
| 13            | PWRFAIL*(B)                            | L               | Power-fail bus signal.                                                                                                                                    |
| 14            | TMA3* (M)                              | L OC            | Temporary-master priority bit 3. Extended-address bit 18.                                                                                                 |
| 15<br>16      | A18 (M)<br>A16 (M)                     | Н               | Extended-address bit 16.                                                                                                                                  |
| · 17          | A17 (M)                                | H               | Extended-address bit 17.                                                                                                                                  |
| 18            | SDSB* (M)                              | L OC            |                                                                                                                                                           |
| 19<br>20      | CDSB* (M)<br>0 V (B)                   | L OC            | The signal to disable the 5 control output signals. Common with pin 100.                                                                                  |
| 21            | NDEF                                   |                 | Not to be defined. Manufacturer must specify any use in detail.                                                                                           |
| 22            | ADSB* (M)                              | L OC            | The signal to disable the address signals.                                                                                                                |
| 23            | DODSB* (M)                             | L OC            | The control signal to disable the data-output signals. (DO7-0 for 8-bit transfers, ED7-0 and                                                              |
|               |                                        |                 | OD7-0 for 16-bit transfers).                                                                                                                              |
| 24            | φ (B)                                  | Α               | The master timing signal for the bus.                                                                                                                     |
| 25            | pSTVAL*(M)                             | L               | Status-valid strobe.                                                                                                                                      |
| 26            | pHLDA (M)                              | Н               | A control signal used in conjunction with HOLD* to coordinate bus-master transfers.                                                                       |
| 27            | RFU                                    |                 | Reserved for future use.                                                                                                                                  |
| 28            | RFU                                    |                 | Reserved for future use.                                                                                                                                  |
| 29            | A5 (M)                                 | Н               | Address bit 5.                                                                                                                                            |
| 30<br>31      | A4 (M)<br>A3 (M)                       | H<br>H          | Address bit 4. Address bit 3.                                                                                                                             |
| 32            | A15 (M)                                | H               | Address bit 15 (most significant for nonextended                                                                                                          |
|               |                                        |                 | addressing).                                                                                                                                              |
| 33            | A12 (M)                                | Н               | Address bit 12.                                                                                                                                           |
| 34<br>35      | A9 (M)<br>DO1 (M)/ED1 (M/S)            | H<br>H          | Address bit 9.  Data-out bit 1, bidirectional even-data bit 1.                                                                                            |
| 36            | DO0 (M)/ED0 (M/S)                      | H               | Data-out bit 0, bidirectional even-data bit 0.                                                                                                            |
| 37            | A10 (M)                                | Н               | Address bit 10.                                                                                                                                           |
| 38<br>39      | DO4 (M)/ED4 (M/S)<br>DO5 (M)/ED5 (M/S) | H<br>H          | Data-out bit 4, bidirectional even-data bit 4. Data-out bit 5, bidirectional even-data bit 5.                                                             |
| 40            | DO6 (M)/ED6 (M/S)                      | H               | Data-out bit 5, bidirectional even-data bit 5.                                                                                                            |
| 41            | DI2 (S)/OD2 (M/S)                      | Н               | Data-in bit 2, bidirectional odd-data bit 2.                                                                                                              |
| 42            | DI3 (S)/OD3 (M/S)                      | Н               | Data-in bit 3, bidirectional odd-data bit 3.                                                                                                              |
| 43<br>44      | DI7 (S)/OD7 (M/S)<br>sM1 (M)           | H<br>H          | Data-in bit 7, bidirectional odd-data bit 7. The status signal that indicates that the current                                                            |
| 45            | sOUT (M)                               | Н               | cycle is an op-code fetch.<br>The status signal identifying the data-transfer                                                                             |
| 46            | sINP (M)                               | Н               | bus cycle to an output device. The status signal identifying the data-transfer                                                                            |
| 47            | CMEMD (M)                              | ш               | bus cycle from an input device.                                                                                                                           |
| 47            | sMEMR (M)                              | Н               | The status signal identifying bus cycles that transfer data from memory to a bus master and that are not interrupt-acknowledgel                           |
| 48            | sHLTA (M)                              | Н               | instruction-fetch cycle(s). The status signal that acknowledges that an HLT instruction has been executed.                                                |
| 49            | CLOCK (B)                              | Α               | 2-MHz (± 0.5%) 40-60% duty cycle. Not required to be synchronous with any other bus signal.                                                               |
| 50            | 0 V (B)                                |                 | Common with pin 100.                                                                                                                                      |
| Table 1.      | Signals and their de                   | finitions       | according to the IFFF-696 standard. The letter                                                                                                            |

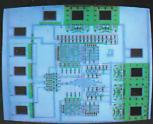
Table 1: Signals and their definitions according to the IEEE-696 standard. The letter in parentheses tells the signal's origin: master, slave, or bus. OC specifies opencollector drivers and A means alternating. (Table 1 continues on page 292.)



"Three Atoms" Courtesy of Greg Abram, University of North Carolina at Chapel Hill



"Aurora" By Richard Katz, Vectrix Corporation



"Integrated Circuit Design" Courtesy of Floyd J. James, University of North Vectrix Corporation Carolina at Chapel Hill



# 95 AND THE FIRST AFFORDABLE HIGH RESOLUTION COLOR GRAPHICS MACHINE IS YOURS

# VX128

. VERY HIGH RESOLUTION 672 by 480 pixels individually addressable

• EIGHT COLORS PER PIXEL 3 bit planes of memory totalling 128K graphics RAM.

 ON-BOARD 16 BIT MICRO-COMPUTER Intel 8088 microprocessor with additional PROM and RAM and built-in expansion capability

· 3D GRAPHICS SOFTWARE PACK-AGE built-in command set includes: rotation, scaling, translation, perspective, clipping, viewport, polygon, and filled polygon

 HARDWARE LINE AND ARC GENERATION on-board VLSI graphics display controller, 1600 nanoseconds pixel drawing time

 USER DEFINABLE CHARACTER GENERATION built-in character set includes zoom, slant, and variable spacing, or upload your own character



SERIAL AND PARALLEL INTERFACE

300-19.2K baud and 8 bit parallel port
• USER FRIENDLY COMMAND FOR-MAT supports high level language and hexadecimal transmissions

# VX384

• 512 COLORS PER PIXEL 9 bit planes of memory with 384K graphics RAM • COLOR LOOKUP TABLE 8 bit

digital-to-analog converters provide a

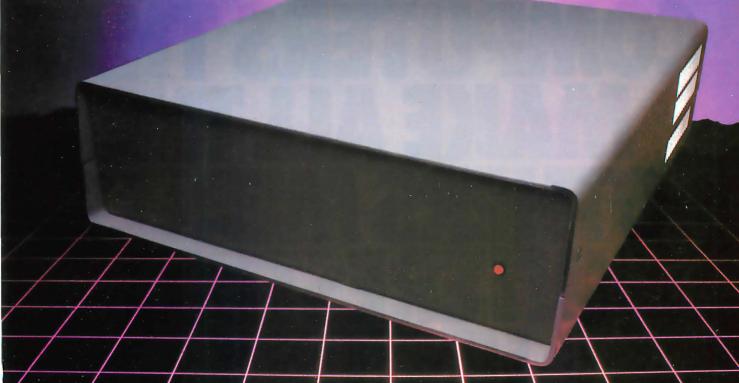
16 million color palate
• INCLUDES ALL FEATURES of

VX128 for total of \$3995

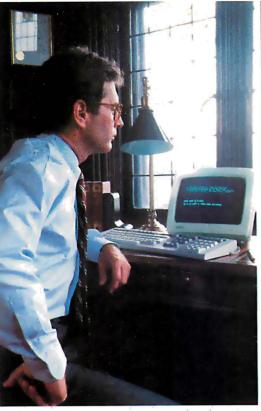
• VXM HIGH RESOLUTION COLOR

MONITOR RGB analog input with 24

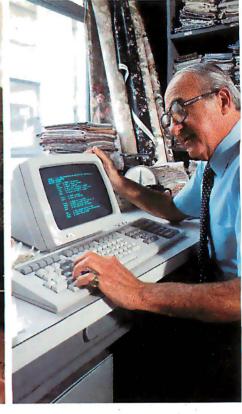
kiloHertz scan rate, long persistence phosphor \$1295
• COLOR GRAPHIC PRINTER



For additional information on VX128, VX584, VXM Monitor or VXP Printer call Toll Free 1-800-334-8181, or 919-272-3479, or write Vectrix Corporation, 700 Bartleground Avenue, Greensbook, NC 27401







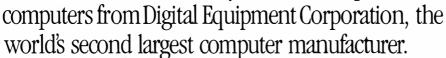
# PERSONAL UTERS THAT COMPU AKEALLTHE OTHERS MERELY TERESTING HISTORY.

There was a time in recent history when people could tolerate the inadequacies of personal computers. We believe that era has ended.

Now you can own personal computers that are more power-

ful, easier to use and more fully supported than any to have come before them.

They are the new personal



Pro 300 Series

The minicomputer of personal computers.



The fully supported small business system.

Digital's personal computers give you more information on the screen. More storage. And communications options that let you talk to other, larger computers anywhere in the world.

When it comes to graphics, you no longer have to settle for the "paint-by-numbers" look of yesterday's systems. Digital's optional bit-map graphics give you four times the resolution of even the very best picture tube. And you no longer have to settle for the pale, bland colors of the past. Digital's personal computers give you a wider palette to pick from.

Even more, you no longer have to be content with a narrow choice of personal computers. For Digital gives you three choices: Rainbow, DECmate, and Professional personal computers. Different kinds of personal computers, because there are different kinds of problems to manage.

> So if you've been unhappy with the history of personal computing thus far, be glad. A new generation has begun. Rainbow 100

To find out more, call 800-DIGITAL and we'll send you our free

The low cost high performance machine.

personal computer brochure. Or write: Digital Equipment Corporation, 129 Parker St., Maynard, MA 01754.



### Table 1 continued:

# Circle 415 on inquiry card. **AVAILABLE** NOW! p-SYSTEM\* (VERSION IV.1) FOR THE THE MOST PORTABLE, **POWERFUL AND POPULAR OPERATING ENVIRONMENT** IS NOW AVAILABLE FOR **IMMEDIATE SHIPMENT FOR** THE VICTOR 9000 / SIRIUS COMPUTER

\*Trademarks Regents of the University of California Victor Business Products

☐ Complete documentation

☐ Runtime only systems also available

700 pages

Combine a great machine with a great operating system

# ONLY FROM TDI:

620 HUNGERFORD DRIVE, SUITE 33, ROCKVILLE, MD. 20850 (301) 340-8700

29 ALMA VALE ROAD BRISTOL, U.K. BS8 2HL 0272-742796

| Pin<br>Number                                      | Signal<br>(and Origin)                                                                                                                          | Activ<br>Level                  |                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 51<br>52                                           | + 8 V (B)<br>- 16 V (B)                                                                                                                         |                                 | Common with pin 1. Instantaneous maximum less than - 14.5 V, instantaneous minimum greater than - 35 V,                                                                                                                                                                                                                                                                            |
| 53<br>54                                           | 0 V (B)<br>SLAVE CLR* (B)                                                                                                                       | L O                             | average minimum greater than -21.5 V.  Common with pin 100.  C A reset signal to reset bus slaves. Must be active with POC* and may also be generated by external means.                                                                                                                                                                                                           |
| 55<br>56<br>57<br>58                               | TMA0* (M)<br>TMA1* (M)<br>TMA2* (M)<br>sXTRQ* (M)                                                                                               |                                 | C Temporary-master priority bit 0. C Temporary-master priority bit 1. C Temporary-master priority bit 2. The status signal that requests 16-bit slaves to                                                                                                                                                                                                                          |
| 59<br>60                                           | A19 (M)<br>SIXTN* (S)                                                                                                                           | H<br>L O                        | , ,                                                                                                                                                                                                                                                                                                                                                                                |
| 61<br>62<br>63<br>64<br>65<br>66                   | A20 (M) A21 (M) A22 (M) A23 (M) NDEF NDEF PHANTOM*(M/S)                                                                                         | H<br>H<br>H                     | to the 16-bit request signal sXTRQ* Extended-address bit 20. Extended-address bit 21. Extended-address bit 22. Extended-address bit 23. Signal not to be defined. Signal not to be defined. C A bus signal that disables normal slave devices and enables phantom slaves—primarily used for bootstrapping systems without hardware                                                 |
| 68                                                 | MWRT (B)                                                                                                                                        | Н                               | front panels.  pWR • — sOUT (logic equation). This signal must follow pWR* by not more than 30 ns.                                                                                                                                                                                                                                                                                 |
| 69<br>70<br>71<br>72<br>73<br>74                   | RFU<br>0 V (B)<br>RFU<br>RDY (S)<br>INT* (S)<br>HOLD* (M)                                                                                       | L O                             | Reserved for future use. Common with pin 100. Reserved for future use. C See comments for pin 3. C The primary interrupt-request bus signal. C The control signal used in conjunction with                                                                                                                                                                                         |
| 75                                                 | RESET* (B)                                                                                                                                      | L O                             | pHLDA to coordinate bus-master transfers.  C The reset signal to reset bus-master devices. This signal must be active with POC* and                                                                                                                                                                                                                                                |
| 76<br>77                                           | pSYNC (M)<br>pWR* (M)                                                                                                                           | H<br>L                          | may also be generated by external means.  The control signal identifying BS <sub>1</sub> .  The control signal signifying the presence of valid data on DO bus or data bus.                                                                                                                                                                                                        |
| 78                                                 | pDBIN (M)                                                                                                                                       | Н                               | The control signal that requests data on the DI bus or data bus from the currently addressed slave.                                                                                                                                                                                                                                                                                |
| 79<br>80<br>81<br>82<br>83<br>84<br>85<br>86<br>87 | A0 (M) A1 (M) A2 (M) A6 (M) A7 (M) A8 (M) A13 (M) A14 (M) A11 (M)                                                                               | H<br>H<br>H<br>H<br>H<br>H<br>H | Address bit 0 (least significant). Address bit 1. Address bit 2. Address bit 6. Address bit 7. Address bit 8. Address bit 13. Address bit 14. Address bit 11.                                                                                                                                                                                                                      |
| 88<br>89<br>90<br>91<br>92<br>93<br>94<br>95       | DO2 (M)/ED2 (M/S) DO3 (M)/ED3 (M/S) DO7 (M)/ED7 (M/S) DI4 (S)/OD4 (M/S) DI5 (S)/OD5 (M/S) DI6 (S)/OD6 (M/S) DI1 (S)/OD1 (M/S) DI0 (S)/OD0 (M/S) | H<br>H<br>H<br>H<br>H<br>H      | Data-out bit 2, bidirectional even-data bit 2. Data-out bit 3, bidirectional even-data bit 3. Data-out bit 7, bidirectional even-data bit 7. Data-in bit 4, bidirectional odd-data bit 4. Data-in bit 5, bidirectional odd-data bit 5. Data-in bit 6, bidirectional odd-data bit 6. Data-in bit 1, bidirectional odd-data bit 1. Data-in bit 0 (least significant for 8-bit data), |
| 96                                                 | sINTA (M)                                                                                                                                       | Н                               | bidirectional odd-data bit 0.  The status signal identifying the bus input cycle(s) that may follow an accepted interrupt                                                                                                                                                                                                                                                          |
| 97                                                 | sWO* (M)                                                                                                                                        | L                               | request presented on INT*.  The status signal identifying a bus cycle that transfers data from bus master to slave.                                                                                                                                                                                                                                                                |
| 98<br>99                                           | ERROR* (S) POC* (B)                                                                                                                             | L O                             | C The bus status signal signifying an error condition during present bus cycle.  The power-on clear signal for all bus devices;                                                                                                                                                                                                                                                    |
| 100                                                | 0 V (B)                                                                                                                                         | _                               | when this signal goes low, it must stay low for at least 10 ms.  System ground.                                                                                                                                                                                                                                                                                                    |
|                                                    | (5)                                                                                                                                             |                                 | -, 5.5 g. 54.14.                                                                                                                                                                                                                                                                                                                                                                   |

# We're selling Tandon with abandon!

We are overstocked!

Our warehouse runneth over with Tandon Drives.

Help!

Help us clear the decks and help yourself to significant savings on these excellent products.

We've always been high on Tandon. (Even when we're not up to our knees in 'em.) They offer an unsurpassed storage capacity, a very advanced dual-head design, increased throughput—and proven reliability.

So at these prices, you should definitely buy a drive. Buy two. Maybe someone you know is having a birthday soon. Buy one for them.

Call immediately. At these prices, they won't last very long. Hopefully.

Tandon's TM100 series of 5-inch mini-floppy disk drives all feature Tandon's patented read/write head design.

Available in four models:

TM100-2 double-sided, 40 track per side, 5.25-inch floppy-disk drive with a storage capacity of 500K bytes unformatted and a track-to-track access time of 5milliseconds.......262.50

TM100-4 A double-sided, 80 track per side, 5.25-inch floppy-disk drive with a storage capacity of 1000K bytes unformatted and a track-to-track access time of 3-milliseconds.......369.00

Tandon's TM848 "Thinline" series of 8-inch floppy-disk drives all feature Tandon's patented read/write head design. The unique "Thinline" design allows two drives to be installed in the same space as a single conventional drive.

Available in two models:

 MODEL III DISK DRIVE KITS

**Kit #1:** Controller Kit and two TM100-1 single-sided, 40 track drives...........638.00

CALL OUR MODEM LINE
FOR WEEKLY SPECIALS

Welbuilt a reputation on our prices and your satisfaction.

We guarantee everything for 30 days. If anything is wrong, return the item and we'll make it right. And we'll pay the shipping charges.

We accept Visa and Master Card on all orders; COD orders, up to \$300.00.

Add \$2.00 for standard UPS shipping and handling on orders under 50 lbs. delivered in continental U.S. Call for shipping charges over 50 lbs. Foreign. FPO and APO orders, add 15% for shipping. Californians, please add 6% sales tax.

Prices quoted are for stock on hand and are subject to change without notice.

To order or for information call

In New York:

(212) 509-1923

In Los Angeles:

(213)706-0333

In Dallas:

(214)744-4251

By Modem:

(213) 883-8976

Alpha Byter COMPUTER

31245 LA BAYA DRIVE WESTLAKE VILLAGE, CA 91362

| Parameter          | Description                                                                     | Minimum            | Maximum            |
|--------------------|---------------------------------------------------------------------------------|--------------------|--------------------|
| t <sub>set</sub>   | Delay pHLDA to ADSB*, SDSB*, DODSB* low                                         | 0                  |                    |
| t <sub>ov</sub>    | Time for both temporary and permanent master to drive the control output lines  | 0.4t <sub>cy</sub> |                    |
| t <sub>DH</sub>    | Hold time for address, status, and data out from end of strobe to CDSB* rising  | 0.2t <sub>cr</sub> |                    |
| t <sub>REL</sub>   | Delay from HOLD* rising to ADSB*, SDSB* and DODSB* high                         |                    | 1.0t <sub>cr</sub> |
| t <sub>HDHĀ</sub>  | Delay from HOLD* false to pHLDA false                                           | 1.0t <sub>cr</sub> |                    |
| t <sub>¢CDSB</sub> | Delay from $\phi$ rising to CDSB* low<br>Delay from $\phi$ rising to CDSB* high | 0                  | 0.3t <sub>cr</sub> |
| t <del>HD</del> HA | Delay from HOLD* falling to pHLDA rising                                        | 1.0t <sub>cr</sub> |                    |
| Table 2: Bi        | us-transfer timing parameters (see also figure 3).                              |                    |                    |

completely modular in nature. Users can purchase just the system they need because any system can be tailored to individual requirements. You are not stuck buying what a manufacturer feels is the optimum computing system.

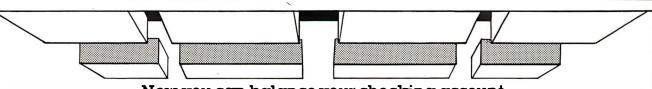
By the same token, a modular system can be upgraded at any time to take advantage of newer technology, expand the system's capabilities as your computing needs grow, or even

turn a single-user computer into one capable of handling multiple users. You have a choice of a wide variety of processor types, including many 16-bit offerings. Some systems even allow a mixture of processor types, including both 8- and 16-bit pro-CESSOTS

Another big advantage of IEEE-696/S-100 systems is the large number of manufacturers with products for that bus. A wide range of products exists for almost any application.

Hardware and software developers prefer the IEEE-696/S-100 bus because the latest technology seems to appear on that bus first. Every major new processor has been available on an S-100 board long before it has been ready for other systems. Computer systems based on the S-100 bus tend to run a lot faster than other systems. Although the standard specifies that the maximum clock rate is 6 MHz, the S-100 bus is capable of running much faster, with some manufacturers routinely shipping 10-MHz products.

Some people perceive cost as a disadvantage to IEEE-696/S-100 svstems. It is true that an S-100-based system may cost more to start with than a single-board-type system, but S-100 systems quickly become much more cost-effective when it comes time to upgrade the system. A singleboard system may have to be discarded altogether; but, change a card or two in an S-100 system, and you



Now, you can balance your checking account... even if you never could before, with

Your personal financial manager

Its unique checkbook reconciliation mode finds the mistakes in your checkbook for you and makes corrections easily.

# For example it:

- •Shows items returned by your bank which you forgot to enter.
- Locates duplicate entries.
- Finds differences in amounts entered in your checkbook, and those charged by your bank.
- Even catches mistakes the bank made.

In short, it enables you to BALANCE YOUR CHECKBOOK with ease and confidence. Or, an unlimited number of checking and credit card ac-The Smart Checkbook counts, for that matter.

# AND THERE'S MUCH MORE...

A powerful data base manager, checkwriter, budget information, automatic and customized reports and tables.

# SMALL BUSINESSES...

Keeps track of Schedule C revenues and expenses and displays them in monthly income statement form for a whole year.

# AT TAX TIME ...

List and total your tax deductions with pushbutton ease for any of 16 Form 1040 tax categories.

# ORDER THE SMART CHECKBOOK NOW...

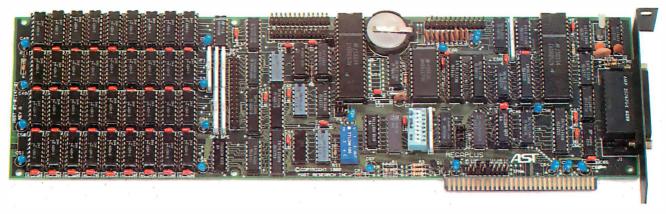
ONLY \$149. Available for most CP/M and CP/M-86 formats (requires 56K) and the IBM PC-DOS (requires 64K). Dealer inquiries welcome.

Phone: (703) 281-1621 OR WRITE: Box 3456

McLean, VA 22103



CP/M is a registered trademark of Digital Research; The Smart Checkbook is a trademark of Softquest



# Still short of features on your QUAD function IBM PC board?

This may really be the only board you need to expand your IBM personal computer. We've now added the most wanted feature on a quadfunction board: two asynchronous ports along with memory, clock/calendar, and parallel printer port. And unlike most big memory boards, you don't have to sacrifice multiple functions to get

512k of add-on memory in a single slot.

### THE BASICS

The main board has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments, clock/calendar with battery back-up, asynchronous communication port (RS232C serial) which can be used as COM1 or COM2. (DCE for a printer, or DTE for a modem). Optional is a 100% IBM compatible parallel printer port,

and a second async port for another \$50 each. Also included are: SuperDriveTM disk emulation and SuperSpoolerTM printer buffer software.

# NO CORNERS CUT

We didn't lower the quality to give you all this. The board is a four layer design with solder masking, silk screened locations, and gold plated edge connectors. Components are premium grade and meet or exceed IBM specifications. Each board is burned in and tested prior to shipment.

# CLOCK/CALENDAR & CLIP-ON BATTERY

Our clock is powered by a simple \$4 lithium watch battery available at your corner drug store. It is clipped on, not soldered like some other clock boards. How useful is a battery warranty that requires you to send your board to the manufacturer to replace it? We send you a diskette with a program that sets the time and date when you turn on your computer. Now your programs will always have the correct time and date on them without you ever having to think about it. (Just which version of that program you were writing is the latest one?)

### **MEGAPAK OF MEMORY**

The picture in the inset shows the optional 256k MegaPakтм board mounted "piggyback" on the main board. This expandability feature gives those who need it 512k of add-on memory in a single slot. Now you can create disk drives in memory up to

320k, set aside plenty of space for print spooling, and still have plenty of memory for your biggest programs. An exclusive design allows the memory to be split at two memory addresses to take full advantage of the memory disk feature of concurrent



# **FREE SOFTWARE**

The disk emulation software creates "disk drives" in memory which access your programs at the speed of RAM memory. The print spooler allows the memory to accept data as fast as the computer can send it and frees your computer for more productive work. Some manufacturers sell hardware printer buffers that do only this for hundreds of dollars. SuperSpoolerTM eliminates the need for these slot robbing products.

# **CHEAP SOFTWARE TOO**

What good is great hardware without some great software to use it with? We offer some terrific prices on some of the popular programs you will want to use your board with. How about the cream of the spreadsheet programs, SUPERCALC, for just \$176. Or maybe dBASE II by Ashton-Tate for just \$469

# WHY BUY IT FROM US?

Because we provide the service and support most companies just talk about. We realize how integral this board is to the use of your computer. What good is a warranty if it takes weeks for repairs to be made? We offer 48 hour turnaround or a replacement board on all warranty repairs. Do you hear anyone else making this promise? If you still are not convinced, and want to compare prices, remember we don't charge extra for credit cards, shipping, or COD fees. If you still want to buy elsewhere, ask them if they will face the acid test.

### THE ACID TEST

Qubie (say que-bee-A) gives you a 30 day satisfaction guarantee on all board purchases. If you are not completely satisfied we will refund the entire cost of your purchase as well as pay the postage to return it. If you can get one of our competitors to give you the same guarantee, buy any other board you think compares and return the one you don't like. We're not worried because we know which one you will keep. We also offer a one year parts and labor warranty. An additional one year extended warranty is available for \$50.

### TO ORDER BY MAIL SEND

- -Your name and shipping address
- -Memory size, and options requested
- —Software and cables needed
- -Daytime phone number
- -California residents add 6% sales tax
- -Company check or credit card number with expiration date (personal checks take 18 days to clear)





### TO ORDER BY PHONE

In California (805) 482-9829 Outside California (800) 821-4479

PRICES: 64k \$375 192k \$499 128k \$439 256k \$599 512k \$998

(Includes async port, memory, clock/ calendar, SuperDriveтм, and Super Spoolertm software)

# **OPTIONS:**

| Parallel Printer Port            | \$50  |
|----------------------------------|-------|
| Second Async Port                | \$50  |
| MegaPakтм with 256k of memory    | \$399 |
| Cable to parallel printer        | \$35  |
| Cable to modem or serial printer | \$25  |
| Memory Diagnostics Program       | \$10  |
| SUPERCALC by SORCIM              | \$176 |
| dBASE II by Ashton-Tate          | \$469 |

# SHIPMENT

We pay UPS surface charges. UPS 2 day air serive \$5 extra. Credit crad or bank check orders shipped same day.

# **QUBIE**' DISTRIBUTING 4809 Calle Alto Camarillo, CA 93010

# MODEM \$12995

No other acoustic modem gives you all these features at this low price.



The MFJ-1232 Acoustic Modem gives you a combination of features, quality and performance that others can't match at this price.

0-300 Baud, Bell 103 compatible. Originate/ Answer. Half/full duplex. RS-232, TTL, CMOS level compatible. Use any computer. Cassette tape recorder ports save data for reloading or retransmission. 6 pole active filter handles weak signals. Carrier detect LED indicates adequate signal strength for data recognition. Quality "muffs" gives good acoustic coupling, isolates external noise for reliable data transfer. Crystal controlled. "ON" LED. Aluminum cabinet. 110 VAC or 9 volt batteries. 9x1½x4 in.

Apple II, II Plus: software and cable for modem, MFJ-1231, \$39.95. Plugs into game port. No serial board needed.

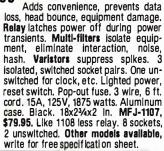


It's like having an extra port

\$7Q95

MFJ-1240 RS-232 TRANSFER SWITCH. Switches computer between 2 peripherals (printer, terminal, modem, etc.). Like having extra port. Push button switches 10 lines (pins 2,3,4,5,6,8, 11,15,17,20). Change plug or cable to substitute other lines. Push button reverses transmitreceive lines. LEDs monitor pins 2,3,4,5,6,8,20. PC board eliminates wiring, crosstalk, line interference. 3 RS-232 25 pin connectors. 7x2x6 in.

\$9995 MFJ-1108 AC POWER CENTER.



Order from MFJ and try It. If not delighted, return within 30 days for refund (less shipping).
One year unconditional guarantee.

Order yours today. Call toll free 800-847-1800. Charge VISA, MC. Or mall check, money order. Add \$4.00 each for shipping and handling.

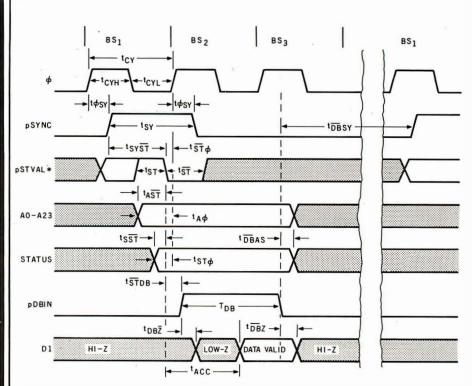
CALL TOLL FREE ... 800-647-1800

Call 601-323-5869 in MS, outside continental USA

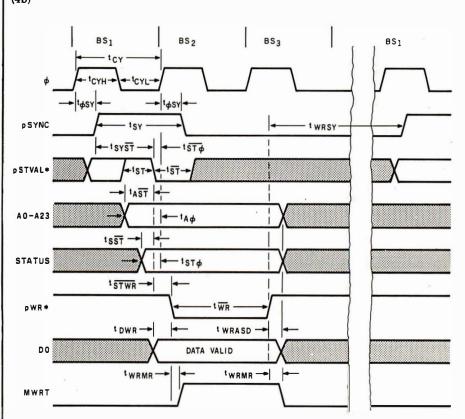
# MFJ ENTERPRISES, INCORPORATED

921 Louisville Road, Starkville, MS 39759

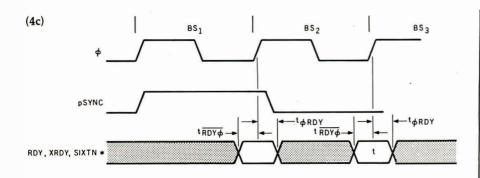
(4a)



(4b)



**Figure 4:** Timing diagrams for basic bus cycles. Figure 4a shows a read cycle; figure 4b shows a write cycle; and figure 4c shows the timing required for the RDY, XRDY, and SIXTN\* signals (when pSYNC is false, RDY and XRDY are tested only when the master is in a wait state).



| Parameter          | Description                                                        | Minimum<br>(ns)                                                | Maximum<br>(ns)             |
|--------------------|--------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|
| tor                | $\phi$ Period                                                      | 166                                                            | 2000                        |
| t <sub>crн</sub>   | $\phi$ Pulse width high                                            | 0.4t <sub>cr</sub>                                             |                             |
| t <sub>cr</sub>    | $\phi$ Pulse width low                                             | 0.4t <sub>cr</sub>                                             |                             |
| t <sub>øsr</sub>   | Delay $\phi$ high to pSYNC high;<br>Delay $\phi$ high to pSYNC low | 10                                                             | 0.4t <sub>cr</sub>          |
| tsr                | pSYNC pulse width high                                             | 0.7t <sub>cr</sub>                                             |                             |
| t <sub>st</sub> o  | pSTVAL* low prior to $\phi$ high during pSYNC                      | 0                                                              |                             |
| t <sub>sr</sub>    | PSTVAL* pulse width high                                           | 50                                                             |                             |
| t <del>s⊤</del>    | pSTVAL* pulse width low                                            | 50                                                             |                             |
| t <sub>ast</sub>   | Addresses stable prior to pSTVAL* low during pSYNC high            | 70                                                             |                             |
| t <i>s≅∓</i>       | Status stable prior to pSTVAL* low during pSYNC high               | 40                                                             |                             |
| t <sub>DB</sub>    | pDBIN pulse width high                                             | 0.9t <sub>cr</sub>                                             |                             |
| t <sub>s∓ DB</sub> | Delay pSTVAL* low to pDBIN high                                    | 20                                                             |                             |
| † <del>DA</del> SY | Delay pDBIN low to pSYNC high                                      | 0                                                              |                             |
| t <sub>deas</sub>  | Hold time for addresses and status after pDBIN low                 | 50                                                             |                             |
| t <sub>DRZ</sub>   | Delay pDBIN low to slave DI drivers high impedance                 |                                                                | 70                          |
| t <sub>DBZ</sub>   | Delay pDBIN high to slave DI drivers active                        | 10                                                             | 70                          |
| t <sub>ACC</sub>   | Delay pSTVAL* low to data valid                                    | Specified by r<br>worst-case m<br>slaves and wo<br>minimum for | aximum for all<br>orst-case |
| t <sub>₩R</sub>    | pWR* Pulse width low                                               | 0.9t <sub>cr</sub>                                             |                             |
| t <sub>stwr</sub>  | Delay pSTVAL* low to pWR* low                                      | 30                                                             |                             |
| t <sub>wrsy</sub>  | Delay pWR* high to pSYNC high                                      | 0                                                              |                             |
| t <sub>D₩R</sub>   | Setup time DO valid to pWR* low                                    | 0.1t <sub>cr</sub>                                             |                             |
| t <sub>wrasd</sub> | Hold time addresses, status, and DO from pWR* high                 | 0.2t <sub>cr</sub>                                             |                             |
| t <sub>₩RMR</sub>  | Delay pWR* low to MWRT high;<br>delay pWR* high to MWRT low        |                                                                | 30                          |
| t <sub>RDY</sub>   | Setup time RDY, XRDY, SIXTN* to φ rising                           | 70                                                             |                             |
| t <sub>ØRDY</sub>  | Hold time RDY, XRDY, SIXTN* after φ rising                         | 20                                                             |                             |
| tpov               | Overlap of PHANTOM* and pDBIN or pWR*                              | 30                                                             |                             |
| t <sub>srsī</sub>  | Delay from pSYNC high to pSTVAL*                                   | 30                                                             |                             |
| t <sub>A</sub> φ   | Addresses stable prior to φ high during pSYNC high                 | 80                                                             |                             |
| t <sub>s∓φ</sub>   | Status stable prior to φ high during pSYNC high                    | 50                                                             |                             |
| Table 3: M         | emory-access cycle timing parameters.                              |                                                                |                             |

# **Users**: **Access IBM** with ReformaTTer

ReformaTTer conversion software lets you read and write IBM 3740 diskettes\* on your CP/M or MP/M system.

ReformaTTer is ideal for CP/M users who want

- · Access to large system data bases
- · Distributed data processing
- Offline program development
- · Database conversion

With ReformaTTer, you have the ability to

- Bidirectionally tranfer complete files between CP/M and IBM
- Automatically handle ASCII/ EBCDIC code conversion
- · Display and alter IBM 3740 directory and data

Enjoy the same advantages of mainframe access that other ReformaTTer users have. Customers like Upjohn, M&M/Mars, The United Nations, Arthur Young & Co., Sandia Labs, FMC Corp., and Stanford University all use ReformaTTer. So can you.

Other versions of ReformaTTer conversion software include

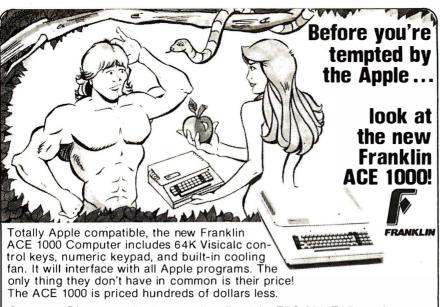
CP/M ↔ DEC (RT 11) TRSDOS Mod. II ↔ CP/M TRSDOS Mod. II ↔ DEC (RT 11) Order ReformaTTer today for only \$249.

\*IBM 3740 basic data exchange format. ReformaTTer requires one 8" floppy drive.



467 Hamilton Av., Suite 2, Palo Alto, CA 94301 CP/M is a reg. trademark of Digital Research

|           |              | ation on the follow-               |
|-----------|--------------|------------------------------------|
| _         |              | CP/M ↔ IBM. My                     |
|           | sales tax).  | \$5 shipping. Cal.  ☐ Charge to my |
| #         |              | exp. date                          |
| Signature |              |                                    |
| Name      |              |                                    |
| Company   |              |                                    |
| Street    |              |                                    |
| City      |              |                                    |
| State     | Zip          |                                    |
|           | licroTech Ex | ports, Inc.                        |



Computer Discount sells the complete Franklin, TRS-80, ATARI, and Apple Computer lines, Epson, Okidata, and C. Itoh printers, and a complete inventory of hardware, accessories and software, and we have cables to interface our printers with Commodore, IBM and Osborne computers — all at the best prices in the U.S.A. Send for our FREE 32 page catalog.

CALL TOLL FREE: 800-526-5313 COMPUTER DISCOUNT OF AMERICA, INC. 15 Marshall Hill Road, West Milford Mall West Milford, New Jersey 07480-219 In New Jersey Call 201-728-8080



# Now anyone can write a powerful program with dBase II and Autocode.

Finally, the first practical application of artificial intelligence in personal computer software. Autocode 1 is a powerful program generator for dBASE II. No prior knowledge of programming required.

# HWYOCODE 1

- Automatic menus & sub menus
- Automatic data entry screens
- Automatic data entry routines
- String, numeric, date & calculated fields
- Automatic multiple reports
- Automatic programs in dBASE II code with interactive screens
- No prior knowledge of dBASE II required
- CP/M & MS DOS operating systems
- Handy pocket size manual
- Average learning time only 4 hours

# STEMMOS LTD.

666 Howard Street, San Francisco, CA 94105 Just send the following to address above today.

- Your diskette format & hardware
- How many Autocodes you want at \$200 each.
- Your name & complete address
- A check or money order.

ORDER TOLL FREE 800-227-1617 (Ext. 417) IN CA CALL 800-772-3545 (Ext. 417)

Credit card buyers may substitute their card number and expiration



date for the check. Or call us tall free and save the trip to the mail box.

U.S. Address: 666 Howard St. San Francisco CA 94105/ U.K. Address: 344 Kensington High Street, London W14 Tel: (415) 777-3800 Dealer Inquiries invited Tel: 01 602 6242

'In California add 6% sales tax

Autocode 1<sup>th</sup> Stemmos Ltd.

may have what appears to be a whole new machine.

Of course, no discussion of IEEE-696/S-100 bus advantages would be complete without mentioning that the existence of a standard helps everybody. It makes the modular concept truly workable.

# The Future of IEEE 696

Those of us in the industry perceive the IEEE-696/S-100 bus to be long-lived. The most powerful systems in the industry are currently available on the bus, and the trend seems to be continuing. With the new standard's provision for 16-bit capability, 16 megabytes of memory, and expanded TMA capabilities, it will be a long time before computing needs outgrow it.

One point I can't stress enough is that, when buying S-100 systems and products, insist upon products that meet or exceed the IEEE-696 specifications. Be wary of the phrase "compatible with IEEE 696." If you are in doubt about a product, ask for verification, or at least get a guarantee.

# Where to Get More Information

If you would like a copy of the standard, send me a legal-size, self-addressed, stamped envelope along with a note indicating your request. By the time this article is published, I should know how the standard is to be distributed. I will return your envelope with a note describing how to get your copy.

Send your self-addressed, stamped envelope to:

Mark Garetz Chairman, IEEE-696 Committee c/o Compupro POB 2355 Oakland Airport, CA 94614-0355

If you want to read a text that describes the IEEE-696/S-100 bus in clear, precise terms, plus gives a wealth of useful circuits and information, pick up a copy of *Interfacing to S-100/IEEE 696 Microcomputers* at a computer bookstore. It is written by Sol Libes and me and is published by Osborne/McGraw-Hill (1981).

dBASE III\*\* Ashton Tate

# **Compare Prices Before You Buy!!**

# COMPUTER SYSTEMS

| EC PC-8001A |  |  |  |  | . \$725 |
|-------------|--|--|--|--|---------|
|-------------|--|--|--|--|---------|

# **Products For Apple Computers**

Here are some of the products BISON carries for Apple Computers. If you don't see what you want here, give us a call

| 16K RAM Card for Apple II                            | \$  | 68  |
|------------------------------------------------------|-----|-----|
| Microsoft Premium Pack                               | \$  | 525 |
| BISON Add-on Disk Drive                              |     |     |
| 100% Apple Compatible                                | \$  | 279 |
| Parallel Printer Card with Cable                     | S   | 72  |
| Apple Compatible Parallel Interface                  | \$  | 65  |
| D. C. Hayes Micromodem II                            | S   | 279 |
| Graphics Interface for NEC, Epson                    | \$  | 129 |
| Microsoft Z80 Softcard with CP/M®                    | S   | 279 |
| Videx 80 Column Videoterm                            | S   | 249 |
| Videx Enhancer                                       | S   | 119 |
| Videx Function Strip                                 | S   | 59  |
| For more Apple information, circle reader service of | arc | #51 |

# **PRINTERS**

BISON carries all of the major brands of printers. If you need help choosing the proper printer for your needs. call and talk to one of our support technicians

| and tall to one or our support to or metallo.      |          |
|----------------------------------------------------|----------|
| EPSON MX-80 F/T Type III w/Graftrax                | \$ 460   |
| EPSON MX-100 with Graftrax                         | \$ 625   |
| NEC PC-8023A Fric. & Trac. w/Graph                 | S 485    |
| NEC 7710-1                                         | \$2095   |
| NEC 7715-1                                         | \$2095   |
| NEC 7720-1                                         | \$2445   |
| NEC 7725-1                                         | \$2445   |
| Okidata Microline 82A 80 Col                       | \$ 439   |
| Okidata Microline 83A w/Trac 132 Col               | \$ 639   |
| Okidata Microline 84P - Parallel                   | \$ 925   |
| Okidata Microline 84PS - 200 cps P/S               | S 999    |
| C. Itoh Prowriter I - Parallel                     | \$ 485   |
| C. Itoh Prowriter I - Parallel/Serial              | S 525    |
| C. Itoh Prowriter II - Parallel                    | \$ 625   |
| C. Itoh Prowriter II - Parallel/Serial             | \$ 675   |
| C. Itoh F-10 Starwriter - Parallel - 40 cps        | \$1225   |
| C. Itoh F-10 Starwriter - Serial - 40 cps          | \$1225   |
| Comrex Daisy Wheel Printer - Parallel              | \$ 735   |
| Comrex Daisy Wheel Printer - Serial                | S 785    |
| Comrex Tractor Feed                                | \$ 195   |
| For more printer information circle reader service | card #52 |
|                                                    |          |

# **MONITORS**

12" Green monitor with P-31 phospher

# **BMC International**

AMDEK Color I.

| 13 WITZ EXCEILENT TO 60 COMMIN display |          |
|----------------------------------------|----------|
| BMC 12" Green Monitor                  | S 89     |
| * 13" Color Monitor* Audio and Video   |          |
| * 270 Line resolution                  |          |
| BMC 13" Color Monitor                  | \$ 229   |
| AMDEK Monitors                         |          |
| 12" Green Phospher                     |          |
| * Non-Glare                            |          |
| AMDEK Video 300 Call for               | or Price |
| * 13" Color Monitor* RGB Input         |          |
| * For IBM/NEC/Apple                    |          |
| AMDEK Color II                         | r Price  |
|                                        |          |

| NEC 12" | Green Monitor     | \$ 169 |
|---------|-------------------|--------|
| NEC 13" | Color Monitor     | \$ 325 |
| NEC 13" | RGB Color Monitor | \$ 815 |

For more information, circle reader service card #53

# TELEVIDEO PRODUCTS

TeleVideo computer terminals and desktop computer systems-high price features at low prices.

### TeleVideo TS-802 Computer system

- 64K, 4 Mhz Z-80A. CP/M®
- Dual Floppies, 720K Total
- Same CRT and Keyboard as Televideo 950 Terminal

Network Expansion Capabilities

TeleVideo TS-802 ..... TeleVideo TVI-925 Terminal . . . . . . . . \$ 695 TeleVideo TVI-950 Term. - Top-of-Line ... \$ 875

For more information, circle reader service card #54

# SOFTWARE

BISON carries software for all business and personal computer systems. Just select the software you want and call us for our current price. Here are some examples of BISON'S Low Prices.

### MicroPro Software

Call for tremendous savings on MicroPro Software

# Apple Software

All APPLE Game and Business software. Select the program you want and call for price. Save up to 60% off list.

# **Accounting Plus by Systems Plus**

For 8" CP/M®

General Ledger \* Accounts Payable \* Accounts Receivable \* Payroll \* Inventory \* Sales Order Entry Purchase Order Entry and Point of Sale G/L, A/R, A/P. G/L, A/R, A/P, P/R ..... G/L, A/R, A/P, P/R, INV ..... G/L, A/R, A/P, P/R, POS, INV G/L, A/R, A/P, P/R, P/Q, INV . G/L, A/R, A/P, P/R, P/O, S/O, INV

# SOFTWARE

| r of Apple II                                                |      |
|--------------------------------------------------------------|------|
| Pick the Apple Combination you need.                         |      |
| G/L                                                          | 276  |
| G/L, A/R                                                     | 553  |
| G/L, INV \$                                                  | 553  |
| G/L, A/R, A/P\$                                              | 649  |
| G/L, A/R, INV\$                                              | 649  |
| G/L, A/P. INV                                                | 649  |
| VisiCalc                                                     |      |
| VisiFile                                                     | 199  |
| dBASE II for 8" or Apple Call for Lowest P                   | rice |
| 35/102 # 10/ 5 5/ Apple 111 <b>52</b> # 10/ <b>2</b> 5/10411 |      |

# S-100 PRODUCTS

### Sierra Data Sciences

| S-100 Master/Slave Single Board Computers | _  |     |
|-------------------------------------------|----|-----|
| 9                                         |    |     |
| Master - 4 Mhz, Z 80A                     | S  | 690 |
| Slave - 4 Mhz, Z 80A                      | S  | 625 |
| Sierra Data CP/M                          | S  | 160 |
| Sierra Data BIOS                          | \$ | 100 |
| Sierra Manual                             | 5  | 25  |
| Sierra Data - Winchester Adaptor          | \$ | 145 |
| Sierra Data Turbo DOS                     | \$ | 750 |
|                                           |    |     |

### **QT-Systems Mainframes**

S-100 Mainframe and 8" Drive Enclosures

- \* S-100 Power +8V/16A +16V/3A -16V/3A
- Drive Power +5V/1A -5V/6A +24V/6A
- **Keyed Power Switch**
- · EMI Filter · Filtered Fan
- Switched Power Outlets
- 15 DB25 Cutouts
- DB37 Cutout \* IDS 50 Cutout
- Hard Disk Power Supply
  Shielded Motherboard \* Rugged Card Cage
- 95/8" x 17" x 21" (H x W x D)

| QT 6-Slot, Dual 8" Drives\$                | 530 |
|--------------------------------------------|-----|
| QT 8-Slot, Dual 8" Drives\$                | 560 |
| QT 12-Slot. Dual 8" Drives \$              | 620 |
| C 100 Mainfrage and E1/" Drive Feelessures |     |

- Similar to 8" Mainframe
- '7" x 17" x 20" (H x W x D)

QT All-in-one 8" Disk Drive Cabinet

Changeable faceplate allows use of all standard 8" floppy and hard disk drives including:

- \* Shugart \* NEC \* Qume \* Mitsubishi
- ' Tandon (Up to 4 Thin-Line)

- ' Holds 1-4 8" Drives ' Modular Power Supply
- \* Power +5V/6A -5V/1A +24V/6A

List Price \$395 . . . . . . . BISON PRICE \$295

# **DISK DRIVES**

| Qume #842 (Replaces Data-Trak 8)   | \$<br>480 |
|------------------------------------|-----------|
| Tandon Thin 8" SnglSide DblDensity | \$<br>382 |
| Tandon Double-Density              | \$<br>465 |

# WABASH FLOPPY DISKS

Single-Sided Single Density Box of 10 8" or 51/4" ..... \$ 19

# SPECIAL OFFER

Buy a Case of Wabash 5-1/4" Diskettes (100 diskettes to a case) and

You Only Pay SAVE \$2.00

\$2.00 A Box



Call for Price

**SON** PRODUCTS INC

"We accept Cash, Certified Checks, VISA and MasterCard" All merchandise new in factory cartons with manufacturer's warranty Coporate and School District P.O.'s accepted subject to credit approval. Enclose financial statement with order.

California residents add Sales Tax. Shipping charges added to all orders. "No refunds without prior approval" - Bison credit only on returned merchandise.

QUANTITIES LIMITED ON SOME ITEMS - PRICES SUBJECT TO CHANGE WITHOUT NOTICE

For Further Information Please Circle Reader Service #55

Add 3% for credit card purchases.

Send Mail Orders To: P.O. Box 9078-184 ● Van Nuys, California 91409

Orders May Be Picked Up At: 16709 Roscoe Blvd., Sepulveda, California 91406 For Ouestions or Phone Orders Call:

213) 994-2533

# CALL"THE COMPUTER-LINE"

The Computerline believes that it is important to be competitive by offering low prices; however, we regard service as the most important aspect of a mail-order organization. All our lines are available so that you, the customer, are able to talk to fully qualified computer specialists trained to answer all your questions pertaining to our line of microcomputers. We are renowned for our excellent after-sales support and our promptness for delivery. Peace of mind and excellence in service is our pledge to all our customers.

# IBM Personal Computer Products

# QUADRAM CORPORATION QUADBOARD The utilimate memory board for the IBM, featuring: • fully expandable from 64 to 256K

- fully expandable from 64 to 256K parallel port asynchronous (RS232) serial port clock calendar HAM disk frive MICROFAZER buffering from (4 to 32 page

# INTERFAZER

- sed as:
  Peripheral buffer
  Multi-User Printer Controller
  Computer I/O Expander
  Incompatible Device Interlace
- Incompatible Device Interface
   Peripheral Multiplexer
   Data Transfer Rate Converter
   \$CALL

# **DAVONG**

Description:
The Davong System Memory Card is a convenient RAM memory expansion card for use in the IBM Personal Computer.
The Memory Card may be placed in any free system slot. It is completely compatible with all IBM Personal Computer software and hardware, and runs of the IBM memory products. at the same speed as IBM memory products.
\_\_\_\_64K RAM \$225 \_\_\_\_\_192K RAM \$499
\_\_\_\_256K RAM \$599

compute while you print
 SCALL

# Hard Disk System for the IBM® Personal Computer.

ONLY \$1595.00

Description: 5 MEGABYTES STORAGE
The Davong System's Hard Disk Drive fits conveniently inside the second floppy disk location of the IBM Personal Computer chassis, providing more than 30 times the capacity of a floppy diskette, plus greater speed and reliability.

The DSI-501 System is compatible with IBM software, and supports IBM DOS\*. The system includes all necessary components and software for

# **TANDON DRIVE** SPECIAL

**Double Sided/Double Density** 320K BYTES STORAGE TM-100-2 **NOW ONLY** 

\$269

Call for TM-100-4

# RGB **Color Monitor** SPECIAL!

- 690 Dots Horizontal
- 16 colorsNon-glare screen

 Sharp looking—matches IBM Princeton Graphic Systems

# **\$CALL**

| IBM SOFTWARE                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                   |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| BUSINESS         \$199           TAX MANAGER         \$169           256K VISICALC         \$169           VISITREND/VISIPLOT         \$239           VISIDEX         \$189           EASY EFFECTIVE         ACCOUNTINIG SYSTEM           ACCOUNTINIG SYSTEM         \$389           SUPERCALC         \$219           SUPERWRITER         \$289 | ENTERTAINMENT   GALACTIC ATTACK   \$26   2ORK   \$29   2ORK   \$29   DEADLINE   \$39   CALL FOR NEW GAMES   AT UNBEATABLE PRICES   T and G JOYSTICKS   \$44,95   ADAM AND   EVE PADDLES   \$29,95 |  |  |
| CALL FOR SO TW                                                                                                                                                                                                                                                                                                                                   | /ARE NOT LISTED                                                                                                                                                                                   |  |  |
| MAYNARD ELECTRONICS Floppy Disk Controller/with parallel Floppy Disk Controller/with serial                                                                                                                                                                                                                                                      | \$229<br>\$259                                                                                                                                                                                    |  |  |

# THE ULTIMATE IBM® **PERIPHERALS**

**Five Function** Memory/Serial/Parallel/Clock/Joystick

# Monte Carlo™

- Up to 1 Megabyte expandable memory
   Full IBM Compatible RS-232 Serial Port
- Full IBM Compatible Centronics Parallel Port
- Real-time clock with built-in alarm features
  Full dual Joystick Port
- Future Option—Plug-on Direct Connect Modem

And the Sensational on a chip

SCALL

# I-C-MAGIC™

GRAPHIC MED/HI RES. SCREEN DUMP PRINT SPOOLING UP TO 64K **TERMINAL EMULATION** \$CALL

| PGS—Princeton Graphics Systems Hi-resolution, RGB Color Monitor        | \$CAL |
|------------------------------------------------------------------------|-------|
| 51/4" Half Height 'Slimline' drives put two floppies in a single slot! |       |
| DAVONG E 10 15M buto                                                   |       |

..... from \$159 Trademarks of Microcomputer Business Industries Corp. (MB)

# Peripherals For All Computers

MONITORS

# Spinwriter 7710/7730 8023A STAR SCALL SCALL

**PRINTERS** 

| F10 Word Quality Printer  • 40 CPS Printing  • Letter quality excellence Now Only \$1395 | SMITH COROL<br>Daisywheel Letter<br>NOW ONLY | Quality |                          |
|------------------------------------------------------------------------------------------|----------------------------------------------|---------|--------------------------|
| Prowriter I 120cps (Parallel)                                                            |                                              | \$      | 469<br>619<br>699<br>749 |
| C-ITOH F10 55 CPS INTEGRAL DATA SYSTEMS PRISM 132 Color printer with all optic           | ons                                          | \$17    | 95                       |
| 200 cps Sprint Mode                                                                      |                                              |         |                          |

| NEC 1201 RGB Color\$                                                                  | 179<br>335<br>899<br>179<br>349 |
|---------------------------------------------------------------------------------------|---------------------------------|
| Princeton Graphic RGB Color \$0  For IBM Electrohome RGB \$  Electrohome IBM Cable \$ |                                 |
| MODEMS                                                                                |                                 |

| Electrohome IBM Cable | 9            |
|-----------------------|--------------|
| MODEMS                | 9 9 15 15 19 |

| DISKETTES (51/4 inch)                    |        |
|------------------------------------------|--------|
| SCOTCH WITH PLASTIC LIBRARY CASES (Boxes | of 10) |
| (48 Track single-sided, double density)  | \$26.5 |
| VERBATIM DATALIFE SS/DD (Boxes of 10)    | \$24.9 |
| VERBATIM DATALIFE DS DD (Boxes of 10)    | \$44.9 |
| ELEPHANT DISKETTES SS/DD (Boxes of 10)   | \$23.9 |
| ELEPHANT DISKETTES DS/DD (Boxes of 10)   | \$39.9 |
|                                          |        |

# **NEC PERSONAL COMPUTER PRODUCTS**

Keybolard and processor unit, including 32K Ram, 24KB N-Basic Rom, cassette tape recorder interface parallel printer interface, display interface. Modular expansion unit, including I O bus extension, diskette adaptor, 32KB Ram, real-timeclock, 8 priority interr 6 stots for additional boards Dual diskette unit, including two 163K byte diskette drives interface cable, unclosure and operating system.

Hard Disk Systems

with NEW NEC-APC-\$CALL

# THE BEST PRICES IN THE NATION ON APPLE PERIPHERALS!

| MBI APPLETIME CARD WORKS WITH DB MASTER AND VISIDEX MOUNTAIN HARDWARE COMPATIBLE | \$89        |
|----------------------------------------------------------------------------------|-------------|
| MBI VIP CARD THE BEST GRAPHICS CARD                                              |             |
| AVAILABLE WITH AN ADDITIONAL CEDIAL DODT                                         | <b>A400</b> |
| (For Modem or 2nd printer)                                                       | \$129       |

# WE'RE SMASHING THE PRICES ON APPLE COMPATIBLE DISK DRIVES

| APPLE COMPATIBLE DRIVES            | <b>MACO</b> |
|------------------------------------|-------------|
| PLUS ONE BOX OF ELEPHANT DISKETTES | \$289       |
| FORTH DIMENSION                    |             |
| DRIVE WITH CONTROLLER              |             |

(including the Apple DOS Master and manual) \$379 PLUS ONE BOX OF ELEPHANT DISKETTES . . . . .

# Call for prices on RANA and MICROSCI drives

| Wes | 80 COLUMN CARDS FOR APPLE         sper 80 Card       \$259         on 80 Card (Vista)       \$269         ex 80 Card       \$249 | RAM CARDS  ng 16K Card, Microtek, icrosoft 16K Card ALL at                                | \$ 79                 | T AND G PRODUC Game Paddles Joy Stick Selecta-port Expander |                | \$ 29<br>\$ 44<br>\$ 49 |
|-----|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------|----------------|-------------------------|
| •   | APPLE WORD PROCESSING Screenwriter II On line's Sensational! Silicon Valley Systems Word Handler II                              | CALIFORNIA COMPUTER SYSTEMS 7710 Async. Serial Int. \$135 7490 GPIB (IEEE-488) Int. \$239 | Hayes Mic<br>Novation | MODEMS FOR APPLE                                            | \$269<br>\$299 |                         |

| List Handler. \$ 79 Call for Continental, Dakin 5, Broderbund, Automated Simulations, Avant-Garde, Edu-Ware, Denver, Howard, Sirius Sensible, Synergistic Software, etc. | 7470 Ana 10 Dig Converter \$ 99 7711 Async. Serial (Term) \$ 135 7712 Sync. Serial Int \$ 149 7721 Apple Parallel Int. \$ 109 Calendam/Clock Module \$ 99 Programable Timer \$ 99 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BUSINESS SOFTWARE                                                                                                                                                        |                                                                                                                                                                                   |
| VISICORP, INC. Desktop Plan III \$229 Visidex \$189                                                                                                                      | MOUNTAIN<br>HARDWARE                                                                                                                                                              |
| Desktop Plan II \$189 Visiterm \$79 Visitiles \$189 Visiter 3-3 \$189                                                                                                    | CPS Multi-Function Card \$129<br>The Clock \$229                                                                                                                                  |

| BUSINESS S                                                                   | SOFTWARE                                                      |                                                                                                                      |                                                             |
|------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| C.      \$229    \$189    \$159    \$229    \$159    \$159    \$159    \$159 | Visidex \$189 Visiterm \$ 79 Visicalc 3-3 \$189 Visipak \$539 | MOUNTAIN HARDWARE CPS Multi-Function Card The Clock Supertalker Music System Expansion Expansion Flomwriter Ram Plus | \$129<br>\$229<br>\$159<br>\$319<br>\$599<br>\$139<br>\$149 |

212 Apple Full 212 Apple Cat 212 Stand Alone Auto Cat **MODEM SOFTWARE** 

Transend II ... ASCII Express **CPM FOR APPLE** 

Microsoft Z80 Softcard MISCELLANEOUS APPLE PRODUCTS

Enhancer II Sup R Mod \$ 79.00 \$ 69.00 Videx Function Strip



DB Utility Pack .....

Visiplot ..... Visitrend Visip

**FORTH DIMENSION** 

# **CALL "THE COMPUTER-LINE"**

(303) 279-2727 (303) 279-2848 1-(800)-525-7877 THE COMPUTERLINE, INC.

1019 8TH STREET. GOLDEN. COLORADO. U.S.A. 80401

# SHOWROOM:

1136 S. COLORADO BLVD. DENVER. CO 80222

Circle 114 on inquiry card.

# **Software Review**

# The Scribble Text Processor

Christopher O. Kern 201 I St. SW, Apt. 839 Washington, DC 20024

Most text-processing programs permit you to describe the appearance of a finished document by establishing the size of the margins, the number of spaces between lines, the indentation at the start of paragraphs, and the like. Processing instructions, which are inserted into the document as it is written, dictate how the text is to appear on the finished page. Each instruction sets one specific typographical attribute of the final document. The average text processor can be compared to a computer assembly language, in which each statement corresponds to a single primitive operation to be executed by the machine.

Scribble, by contrast, might be described as a high-level language for text. A single formatting instruction in a Scribble document could correspond to several of the more primitive instructions that are available in other text-processing programs.

# About the Author

Chris Kern is a Washington, DC, journalist and a frequent contributor to BYTE.

Scribble isn't perfect, and as with any other high-level language, whether or not you are comfortable with it will be to some extent a matter of taste. But there is no question that Scribble can greatly simplify the production of complex documents. It represents a real step forward in the evolution of text-processing tools for small computers.

# Scribble might be described as a high-level language for text.

This ability to perform complex operations in response to a single formatting instruction changes the way users think about the documents they are creating. With the average textprocessing program, the sequence of commands to display a long quotation within a text would be "skip a couple of extra lines, enlarge the left margin slightly, enlarge the right margin slightly, and single space."

The analogous Scribble command would be "format the next piece of text as a quotation." Scribble encourages users to ignore the final appearance of the document-the program will take care of that for them and to concentrate instead on the logical relationships among the various sections of their texts. Scribble instructions tend to be functional rather than typographical.

# Scribble Environments

For example, business letters are commonly formatted with the sender's address, date, and closing signature on the right side of the page. With one popular type of text processor, the sequence of commands would be something like those shown in figure 1a.

This sequence tells the text-processing program to indent the address 40 characters from the current left margin (.in +40) and to stop filling each line with as many words as possible (.nf). After the address is typed, the text processor is told to restore the previous left margin and to resume filling text. The same sequence of commands must be repeated for the

# Apple\* en CASTELLANO 型 Tercer Medio presenta su sistema administrativo (T.M.A.) para Apple

Diseñado de acuerdo con los principios contables aceptados en todos los países de habla hispana.

# APLICACIONES COMERCIALES Y CIENTIFICAS

# CONTABILIDAD **GENERAL**

Diario General Resumen del Diario Consulta parcial al Diario Mayor General Balance de Comprobación **Balance General** Ganancias y Pérdidas Catálogos de Cuentas Consultas por pantalla

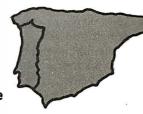
# CUENTAS POR COBRAR

Catálogo de Cuentas Listado de Transacciones Antigüedad de Saldos Saldos por Vencer Relación de Cobranzas Relación de Pagos Estado de Cuentas Consultas varias por pantalla

- INVENTARIO Y FACTURACION
- CONTROL DE BANCOS
- PERT/CPM
- CUENTAS A PAGAR
- **CONTROL DE COSTO DE OBRAS**

# /ENTAJAS DEL SISTEMA T.M.A.

- Son completamentes conversacionales,
- El chequeo de la información es instantáneo.
- Los reportes impresos o por pantalla guardan los formatos generalmente aceptados.
- Están pensados para adaptarse a cualquier empresa.
- Toda la información está instantáneamente disponible
- Precisión Expandida.
- Números de hasta + 999.999.999.99



Circle 410 on inquiry card.



**APARTADO DE CORREOS 62533** CARACAS 1060 - A - VENEZUELA TELEX: 27,876 - CPB TH - VE.

TELEFONOS: 283,60,88 - 284,74,68



# SUPERBRAIN

The super performing, super reliable microcomputer from Intertec Data Systems features twin double-density 5¼" drives with 350K or 700K of disk storage – expandable to 10 megabytes. A CP/M\* Disk Operating System, 64K of dynamic RAM and more.



Because we're a nationwide distributor of SuperBrain, CompuStar, and the CompuStar 10-Megabyte Disk Storage System, we can offer the absolute lowest prices in the business.

# SUPER T SERVICE

Better yet, we offer you a great deal of service and support because we want your business tomorrow as well as today.

- We'll burn-in your SuperBrain for 72 hours before we deliver it
- We'll help with installation and configuration
- We'll repair equipment at our service center and replace modules when necessary
- We'll fill your software needs or help you develop your own
- We'll match your SuperBrain with a super printer

For more information call 609-424-4700 or 215-629-1289. To order call toll-free 800-257-5217. In NJ call 609-424-4700.



Cherry Hill, NJ 08003

\* Registered trademark of Digital Research Inc. SuperBrain and CompuStar are trademarks of Intertec Data Systems.



# At a Glance

### Name

Scribble, version 1.3

### Type

Text-processing software

### Author

Mark of the Unicorn POB 423 Arlington, MA 02174 (617) 489-1387

# Distributors

Westico, Lifeboat Associates, Cornerstore or direct from manufacturer

### Price

\$175

### **Format**

Various CP/M disk formats

### Computer

CP/M 8-bit machines; CP/M-86 version to be introduced

### Documentation

100-page user manual; 99-page program logic manual

### **Audience**

Anyone needing a sophisticated text-processing program

(1a)

.in + 40

.nf

1600 Pennsylvania Ave.

Washington, D.C.

Jan. 20, 1985

.in -40

.fi

(1b)

@address<1600 Pennsylvania Ave.

Washington, D.C.

Jan. 20, 1985>

**Figures 1 a and 1b:** Comparison of Scribble formatting commands with those of another word processor. Figure 1a shows how the address portion of a letter might be done using a popular word-processing program; figure 1b shows the same address with analogous Scribble commands.

closing of the letter. To do the same thing with Scribble, the source text would look like figure 1b.

The command @address and its synonym, @closing, are examples of what Scribble's authors call *environments*. (The @ character is reserved to signal commands to the Scribble text processor.) An environment is a section of text that is to be formatted in some particular way. For example, in the @address environment:

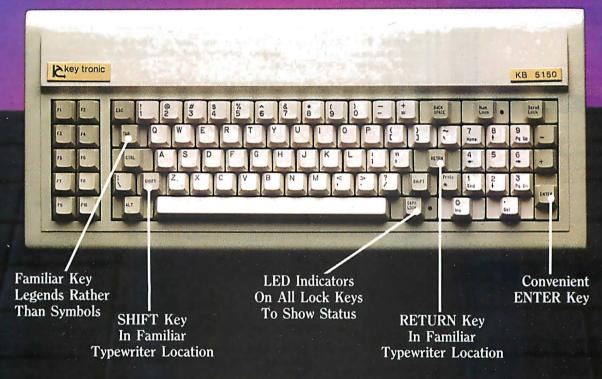
—Each line is kept the same length as it appears in the input file (i.e., short lines are not filled and long lines are not wrapped).

—The lines of the address are left-justified.

—The left edge of the address is placed at the center of the page.

Scribble provides 23 predefined environments. One is the @itemize environment, which arranges a list of items in the format shown in the preceding paragraph. Another environment prints long quotations as single-spaced, indented paragraphs so that they will stand out from the surrounding text. Several other Scribble environments perform operations that are available in all sophisticated text-processing programs. Text can be centered or printed flush left or flush right. You can also create paragraphs with hanging indentations, in which the first line of the paragraph is

# KEY TRONIC PERFECTS THE IBM\* PC KEYBOARD



Enhance your IBM\* Personal Computer System with a Key Tronic keyboard peripheral.

This low-profile keyboard is plug-compatible and has familiar key placement. It also features reliable microprocessor electronics, solid-state capacitance switches, and positive tactile feedback.



Price: \$235.00, includes shipping & handling. To Order Model KB-5150 Call Toll Free 1-800-262-6006 (8 a.m. - 4 p.m. Pacific Standard Time)

THE RESPONSIVE KEYBOARD COMPANY

DEPT. E • P.O. BOX 14687 • SPOKANE, WASHINGTON 99214 USA

# **HOT PRICES! FAST SERVICE! COMPUTERS**

| Model                          | List    | Our Price |
|--------------------------------|---------|-----------|
| SB II 350K byte, 64K           | .\$2495 | \$1875    |
| SB II QD 750K, 64K             | .\$2995 | \$2250    |
| SB II SD 1.6mb, 64K            |         | \$2750    |
| Syscom 48K, Apple Compatable . | \$725   |           |
| BASIS 108, Apple Compatable    |         | Call      |
| ALTOS                          |         | Call      |
| FRANKLIN, Apple Compatable     |         | Call      |
| EAGLE                          |         | Call      |
| COMMODORE 64                   |         | Call      |

# DISK DRIVES \$199 IRM SS/DD .... \$259

# IBM DS/DD ..... APPLE Compatible S/S ......\$219

# **PRINTERS** Epson MX80FT. 80 cps ......**\$519** Okidata 83A. 120 cps ..... \$719 NEC 3510 or 3530 ......\$1575

# MODEMS

Other Brands .....

NEC 7710/7730 ..... Call

|                   |    |  |  |  |   |  |  |  | - |        |
|-------------------|----|--|--|--|---|--|--|--|---|--------|
| Hayes Smartmoden  | ١. |  |  |  |   |  |  |  |   | \$219  |
| Hayes 1200 Baud . |    |  |  |  | , |  |  |  |   | .\$549 |
| Other Brands      |    |  |  |  |   |  |  |  |   |        |

# **MONITORS & TERMINALS**

| NEC 12" Green Screen     |   |   |    |  | * |  |  | \$162      |
|--------------------------|---|---|----|--|---|--|--|------------|
| Amdek Amber Screen .     |   |   |    |  |   |  |  | <br>\$165  |
| Taxan   380 resolution . |   | × | ×. |  |   |  |  | \$310      |
| BMC Green Screen         |   |   |    |  |   |  |  | <br>. \$85 |
| Adds Viewpoint, green    | ÷ |   |    |  |   |  |  | \$545      |

# **APPLE & IBM ITEMS**

| Seattle Computer Products     | II |
|-------------------------------|----|
| Quadram Products              | I  |
| Mountain Computer Products    | I  |
| Practical Peripheral Products | II |
| Viewmax 80 col. card          | 9  |
| Videoterm 80 col. card        | 2  |
| Software Call for Great Price |    |

Information: Call (206) 362-3398

# ORDERS ONLY 1-800-531-3133

Mail & Phone Orders Only. Prices reflect 3% cash discount. Sorry, no COD.

# PACIFIC COMPUTERS

11056 Palatine N. Seattle, WA 98133 (2a)

 $\hbox{\tt Qdescription} \\ \hbox{\tt <FORTRAN @\ \ } \\ \hbox{\tt The great progenitor.} \quad \hbox{\tt A real step} \\$ forward in its day, but it has had a tendency to hold back progress ever since.

COBOL @\ Is prolix. Reminds me of what Abraham Lincoln once said about a fellow lawyer: "He can compress the most words into the smallest ideas of any man I ever met."

BASIC @\ You can love it or you can hate it, but you can't ignore it. BASIC is characterized by the best acronym of the lot: "Beginner's All-purpose Symbolic Instruction Code."

PL/I  $@\$  Is to computer languages what Texas is to states: smaller than Alaska but bigger than everything else.

LISP @\ Can be most clearly described in LISP. ((Parenthetically, LISP is considerably easier to use than many people think.) LISP can be thought of as a "high-level machine language" in which other languages can be written, an attribute that has proved important in research.

C @\ Simple, clean, terse.

Pascal @\ Pascal is for classroom use. It is precise and mathematical. A Swiss professor thought it up. He should have taken a sabbatical.

Ada @\ The future, formally certified by the Department of Defense. Ada is the government's attempt to negotiate a computer language nonproliferation treaty with itself. But, sources say, the parties are still far apart.>

(2b)

FORTRAN The great progenitor. A real step forward in its day, but it has had a tendency to hold back progress ever since.

Is prolix. Reminds me of what Abraham Lincoln COBOL once said about a fellow lawyer: "He can compress the most words into the smallest ideas of any man I ever met."

You can love it or you can hate it, but you can't ignore it. BASIC is characterized by the best acronym of the lot: "Beginner's All-purpose. BASIC Symbolic Instruction Code."

PL/I Is to computer languages what Texas is to states: smaller than Alaska but bigger than everything else.

LISP Can be most clearly described in I.TSP. ((Parenthetically, LISP is considerably easier to use than many people think.) LISP can be thought of as a "high-level machine language" in which other languages can be written, an attribute that has proved important in research.

C Simple, clean, terse.

Pascal is for classroom use. It is precise and Pascal mathematical. A Swiss professor thought it up. He should have taken a sabbatical.

The future, formally certified by the Department of Defense. Ada is the government's attempt to Ada negotiate a computer language nonproliferation treaty with itself. But, sources say, the parties are still far apart.

Figures 2a and 2b: An example of Scribble's @description environment, which formats a series of items in a way that permits them to be listed and then elaborated individually. Figure 2a is the input file. The @  $\setminus$  characters are typewriter-style tabs that instruct Scribble to place the next printing character at the @description environment's preset tab position. Figure 2b shows the result.

# FOX & GELLER gives dBASE II™ users 10 good reasons why they need QUICKCOD The dBASE II™ Program Generator

# Reason

# Save Time.

Quickcode saves you time, because it can write complete dBase II applications programs in minutes.

# Reason

# Ease of Use.

Quickcode requires no programming or computer knowledge. If you can type, then you can create a customer or inventory database in 5 minutes.

# Reason

dSCAN.TM

The unique dSCAN feature lets you select records based on your own requirements (e.g. STATE = 'NJ' or AGE > 30). Then you can print them in a variety of formats (or transfer them to Wordstar™ for form letters.

# Reason



# Wordstar.

If you want to create form letters using your data, Quickcode can transfer any part of your database to Wordstar.™



# Mailing Labels.

Want to print mailing labels? With Quickcode, you can get them in one up or four up format. You can print labels of almost any size or shape you can imagine. For any part of your database (e.g. ZIP CODE = 90023)

# Reason



Quickcode can create an amazing variety of reports and forms. You can even produce reports up to 132 columns by 96 lines per page.

# Reason



# Power.

Quickcode can set up retrieval keys using as many as 10 data fields. You can use these keys to get any record from your database in about 2 seconds. Data entry is also a snap. You can have any data field automatically set to a default valve or checked in one of three ways: range checking, match list checking, or file lookup.

# Reason



Now, you can use four new data types not found in dBASE II itself: date, money, telephone, and social security. Just what you need to simplify your work.

# Reason



# Menus.

Want to set up a more powerful application? Use the Quickcode menu generator to create a menu system.

# Reason



# Fox & Geller.

Perhaps the most important reason to buy Quickcode. We've built a reputation for quality products that *keep improving*. Like dGRAPH (the dBase II graphics system) and our dUTIL utility.

# Fox & Geller's Quickcode: \$295.00

We intend to earn your loyalty by offer-Ing software that's the best.

For further information or to see Quickcode in action, see your local dealer or call (201) 837-0442.

Teaneck, NJ 07666 201 837-0142

Quickcode and dSCAN are trademarks of Fox & Geller, Inc. dBASE II is a trademark of Ashton-Tate Wordstar is a trademark of MicroPro International

307

### (3a)

@begin<level>
Scribble provides facilities for automatic numbering of
sections and paragraphs of documents.

A number of different formats are available. @begin<level>
For example, you could number the sections of a document but not the individual paragraphs.

Different levels of numbering are automatically provided. This paragraph, for example, has two levels of numbering.

Indentation can also be controlled to a considerable extent.  $\theta end < level >$ 

This feature greatly simplifies the creation of documents that have a complex and explicit structure, such as technical manuals. @end<level>

### (3b)

- Scribble provides facilities for automatic numbering of sections and paragraphs of documents.
- 2. A number of different formats are available.
  - 2.1. For example, you could number the sections of a document but not the individual paragraphs.
  - 2.2. Different levels of numbering are automatically provided. This paragraph, for example, has two levels of numbering.
  - 2.3. Indentation can also be controlled to a considerable extent.
- This feature greatly simplifies the creation of documents that have a complex and explicit structure, such as technical manuals.

**Figures 3a and 3b:** An example of Scribble's @level environment, which is one of several ways provided by the program to automatically structure and number sections of text. Note that one instance of the environment is nested within another to improve readability. The @begin < level > and @end < level > instructions in the source text of figure 3a are synonyms for the @level < and > syntax that would normally enclose the text of the environment if you weren't nesting instructions. Figure 3b shows the result.

flush left but all subsequent lines are indented. Somewhat more unusual is the @description environment, which formats text into two columns (see figure 2 on page 306.)

# Structured Text

Scribble includes a variety of environments that make it easy to structure text into a series of indented and sequentially numbered paragraphs of the kind commonly found in textbooks and technical manuals. Sections and subsections of a document are automatically set apart and numbered. This makes it easy to create or change a complex document composed of numbered sections and para-

graphs. You can insert new material knowing that the indentation and numbering of the document will be preserved and, where necessary, updated automatically (see figure 3).

Environments are what distinguish Scribble from other text-processing programs. The only real problem is that the average user will have to accept each environment as it was defined by Scribble's authors. Fortunately, the stylistic choices that the authors have made are reasonable. Source code for most of the program, written in the C computer language, is supplied as part of the package. The authors explain the program logic in some detail in the Scribble

manual, and an experienced C programmer should have no great difficulty modifying the program. There is even a Scribble users group to distribute extensions to the program. Still, it would be nice to be able to redefine the existing environments without programming. Ideally, it should be possible to create entirely new environments, each composed of primitive text-formatting commands or even other environments.

# Other Commands

In addition to environments that format an entire block of text. Scribble provides 10 inline environments to determine how individual characters are printed. These provide familiar features such as underlining, boldface, subscripts, and superscripts. Even though these operations are common to most text-processing programs, Scribble's attention to detail is impressive. For example, Scribble includes three different underscore commands: underscore all printing characters, underscore only alphanumeric characters, and underscore continuously. Two separate italics commands—regular and boldface provide insurance, the authors say, against the day when printers with italics capability are more commonly

In many cases, you can nest Scribble environments and inline environments. That is, you can give one command inside another. For example, one element in an itemized list can be underscored, or the @level environment depicted in figure 3a can be invoked within itself to produce multilevel structures (the second level in figure 3b was produced this way).

The remaining category of Scribble commands, which the program's authors refer to as *directives*, is composed of instructions that, for the most part, cannot contain other Scribble instructions. Some directives are similar to inline environments in that they provide commonly available text-processing functions. You will find directives to define page headings and footings, to skip lines or start new pages, and to read and insert other files into the running text. Footnotes are automatically num-

bered, and one directive specifies whether the notes are to be printed within the text, at the bottom of each page, or at the end of the document.

# The @style Directive

The @style directive takes a variety of arguments. It is used to specify margins, paper size, the extra space (if any) between paragraphs, the amount of indentation for new paragraphs, whether the text is to be justified, and other fundamental stylistic characteristics. One nice feature of the @style directive is that, where it requires numeric arguments (such as in specifying paragraph indentation), the argument can be entered in just about any unit of measure that is handy. The @style directive will accept arguments expressed in characters, lines, centimeters, millimeters, points, picas, ems (these last three are printer's measures), and micas. A mica is the internal unit of measurement used by Scribble. It corresponds to 10 microns, or about 1/2540 of an inch. Unfortunately, relative values are not permitted. So, for example, it is impossible to issue a command to increase the line spacing by one.

A number of other Scribble directives concern various types of automatic numbering. You can have the sectioning directives number portions of the text. There are six of them, corresponding to chapters, sections, subsections, and paragraphs for the main body of the text, and chapters and sections for appendixes. Each sectioning directive creates a subtitle or heading in the document. Every time you invoke a sectioning directive, an entry is automatically made in the document table of contents. Similarly, an @index directive automatically creates an index for the document. The instruction @index < message > within a Scribble text creates an index entry composed of the message and a reference to the current page.

The remainder of the directives deal mostly with string and numeric variables. Section numbers and headings are automatically maintained by Scribble, as is the current page number. Other variables can be defined by the user. For example, a common-

ly used string, such as an address, can be defined once in a document and introduced repeatedly into the text simply by referring to a single-word variable name. You can change variables or set them to the value of other string variables. You can add or subtract numeric variables.

# **Printing Scribble Files**

Scribble itself can display formatted documents on the system console or on a simple Teletype-style printer (i.e., one that does not need any special control codes). Scribble can also write a formatted document to a disk file. If a more sophisticated printer is available—for example, one that has a proportionally spaced type font or one that can move up a fraction of a line to provide properly superscripted footnotes—a second program must be used to put the finished document on paper. Splitting up the formatting and printing jobs introduces an extra step, but it keeps

# MARTIN MARIETTA

# AEROSPACE

# DATA PROCESSING OPPORTUNITIES

Martin Marietta Aerospace, NASA's prime Contractor for the Space Shuttle External Tank has immediate openings for Data Processing professionals. Because we actually manufacture the external tank, you'll get to see the actual results of your efforts.

# COMPUTER PROGRAMMER/ANALYSTS

Immediate opportunities exist for individuals experienced in:

# •UNIVAC 1100

ASC11 COBOL DMS 1100 DDL, SDDL, DMU DML, QLP DPS 1100, TIP D/B Editor

# •APPLICATION EXPERIENCE

Shop floor control. Scheduling, Manufacturing, Inventory, Purchasing, Configuration Management, Quality, Engineering.

# •DATA BASE OPENINGS

Analyst, Design, Administrators with above hardware, software and applications experience.

These opportunities exist at our Michoud Assembly Facility located in suburban East New Orleans.

Qualified candidates interested in learning more about these opportunities at Martin Marietta should forward resumes, including salary history to Martin Marietta Aerospace, Denver Glazier, BYTE-283, P.O. Box 29304, New Orleans, Louisiana 70189. We are an equal opportunity employer, m/f/h.

MARTIN MARIETTA

the size of the Scribble program manageable without sacrificing flexibility.

For all but the simplest printers, Scribble produces an intermediate, formatted file. This file contains a minimum of information about the actual device on which the document will be printed. A second program, called Crayon, reads the intermediate file and prints the finished document. Cravon knows the details of different printers and produces the required control sequences to make the most out of each printer's specific hardware capabilities. You can make a rough draft quickly on a high-speed, dot-matrix printer. Then a finished copy can be made on a letter-quality printer, using proportional spacing, special type fonts, or whatever sophisticated features are available.

Different printers, by the way, don't really have to be literally different machines. The user can create several *logical* device specifications for the same physical machine. For example, a formfeed could move the forms one distance for printing out mailing labels and a different distance for printing correspondence. The same physical printer might be used in both cases, but the meaning of formfeed would depend on the particular application.

# Configuration

The Scribble/Crayon system is delivered with the ability to drive the most common small-system printers. It comes with a configuration utility that makes customizing the programs for many other printers and creating

"logical" printers fairly simple. It may be necessary to write new driver code for a printer with unusual control sequences.

The configuration program has several other functions. It can reset the default style parameters for such features as margins, line spacing, paragraph indentation, and the like. (Of course, these can be set by @style directives inside the text of each document as well.) The configuration program also enables the user to define certain input and output characteristics of the host computer system. In most cases, installing Scribble should pose no obstacle even to a nontechnical user.

The Scribble manual is complete and well organized. Mark of the Unicorn provides a tutorial introduction along with an extensive user's manual. I found the user's manual difficult to follow in a few places, but for the most part, the writing is clear if undistinguished. Scribble takes a of getting used to precisely because it is different from most other text-processing programs. But that, of course, is why it is worth the effort. Separate documentation is provided in the manual to explain the source code modules. As might be expected, these sections are written for the programmer, not the casual user. Incredibly—because it could have been produced so easily using Scribble—the manual has no index.

Scribble is fun to use, even on a relatively simple document such as this article, but it is at its best when used to produce complex or long documents, especially highly structured, technical ones. Scribble would be an excellent program to use to write computer reference manuals, by the way. Too many manuals lack clarity, regardless of the quality of the writing, because of poor organization and format. Scribble's automated sectioning, footnoting, indexing, and table-of-contents features should greatly simplify the creation of complex, multilevel texts.

### Conclusions

- Scribble can be described as a highlevel language for text processing that encourages users to concentrate on the structure of the document.
- •Scribble environments deal with relatively large sections of text. The program also provides conventional commands for instances where a predefined environment is not appro-
- Scribble comes with source code for most program modules, making it possible to alter or extend its capabilities.
- •Scribble is capable of using the sophisticated hardware features of the most common small-system printers.
- Scribble is at its best when it is used to produce long or complex documents.

Mark of the Unicorn is now selling version 1.4 of Scribble, which is advertised as being substantially the same as version 1.3 with a few bugs worked out. . . . Ed.] ■

# Compilers

| HOST                       | 6809<br>TARGET                               | PDP-11*/LSI-11*<br>TARGET  | 8080/(Z80)<br>TARGET                   | 8088/8086<br>TARGET              |
|----------------------------|----------------------------------------------|----------------------------|----------------------------------------|----------------------------------|
| FLEX*/UNIFLEX*<br>OS-9*    | \$200.00 WIHO ST 10 AT 1 S 350.00 WITH 10 AT | 500.00                     | 500.00                                 | 500.00                           |
| RT-11*/RSX-11*<br>PDP-11*  | 500.00                                       | 200.00 WITH<br>350.00 WITH | 500.00                                 | 500.00                           |
| CP/M*<br>8080/(Z80)        | 500.00                                       | 500.00                     | 200.00 WITHOUT<br>350.00 WITH<br>ILOAT | 500.00                           |
| PCDOS*/MSDOS*<br>8088/8086 | 500.00                                       | 500.00                     | 500.00                                 | 200.00 WIRDER<br>350.00 WIR HOAD |

\*PCDOS is a trademark of IBM CORP, MSDOS is a trademark of MICROSOFT. UNIX is a trademark of BELL LABS, RT-11/RSX-11/PDP-11 is a trademark of Digital Equipment Corporation. FLEX/UNIFLEX is a trademark of Technical Systems consultants. CP/M is a trademark of Digital Research. OS-9 is a trademark of Microware & Motorola

### • FULL C

- UNIX\* Ver. 7 COMPATABILITY
  - NO ROYALTIES ON GENERATED CODE
    - GENERATED CODE IS REENTRANT
      - C AND ASSEMBLY SOURCE MAY BE **INTERMIXED** 
        - UPGRADES & SUPPORT FOR 1 YEAR

408-275-1659

# **TELECON SYSTEMS**

1155 Meridian Avenue, Suite 218 San Jose, California 95125



Plug 3,000 new applications into your Apple.

THE CP/M Card™ plugs CP/M Plus™ into your Apple. The CP/M Card gives you the option of running your Apple II with the speed and capability of a professional Z-80 system with CP/M\*-compatible software. You plug in the CP/M Card. Then choose CP/M or your standard Apple software at your option.

Plug into a big, new world of software. The CP/M Card gives you instant access to the world's largest selection of microcomputer software—more than 3,000

Selection of microcomputer software—more to CP/M-compatible applications, languages, and programming utilities. So, you, too can use professional business programs such as WordStar,® SuperCalc,™ Condor,™ and other high-performance software from Day One. Yet, you still have access to your present library of Apple software.

Plug into incredible performance.

Together; the ultra-fast CP/M Card and CP/M Plus run applications up to

300% faster than your Apple system! The CP/M Card is the only Apple II performance package that offers the speed and efficiency of CP/M Plus.

A plug about quality.

The CP/M Card was designed and built by Digital Research, the creators of CP/M, and Advanced Logic Systems, the most respected manufacturer of Apple performance products. So you know the CP/M Card is the most perfectly integrated Apple performance package you can buy.

Why just keep plugging along? The CP/M Card provides everything you need—including 64K of on-board memory, CP/M Plus, CBASIC, GSX™-80 and full documentation—for just \$399.

Now available through the CP/M library. See your local microcomputer dealer today. Or contact Advanced Logic Systems, 1195 East

Advanced Logic Systems Arques Ave., Sunnyvale, CA 94086 (800) 538-8177. (In California (408) 730-0306.)

The CP/M Card for your Apple II.

CP/M, CP/M Plus, the CP/M Card and CBASIC are either trademarks or registered trademarks of Digital Research Inc. Z-80 is a registered trademark of Zilog, Inc. WordStar is a registered trademark of MicroPro International Corporation. SuperCalc is a trademark of Sorcim Corporation. Condor is a trademark of Condor Computer Corporation. GSX-80 is a trademark of Graphics Software System. Apple is a registered trademark of Apple Computer, Inc. ©1982 Digital Research Inc.



# Draw attention to yourself.

(Write a program for the IBM Personal Computer.)

Let your imagination take wing.

Think charts. Graphs. Shapes. Images.

Use originality, creativity and color in programs that entertain. Educate. Organize. Analyze. And programs that get down to business.

Maybe you've written software like that. Or perhaps you're thinking about it.

If so, consider this.

You could draw attention to yourself by writing programs for the IBM Personal Computer on the IBM Personal Computer. Because all our advanced features (see the box at right) make it faster and easier to do so.

Enhanced BASIC already in ROM, for example, has graphics commands already built in.

And if you write a program using our Advanced BASIC, you'll find the DRAW command particularly appealing. It's virtually a separate graphics language within a larger language.

Put your visual together with any of the 128 characters and symbols in ROM for a simultaneous, text-and-graphics mix.

Have musical accompaniment as well.

It's easy, because BASIC controls the built-in

speaker with a single command.

Utilize the ten, programmable function keys. Try F3 to paint. F4 for lines. F5 for circles. Or F6 for boxes.

# IBM PERSONAL COMPUTER SPECIFICATIONS

User Memory 16K-512K bytes Microprocessor 16-bit, 8088\*

Auxiliary Memory 2 optional internal diskette drives, 51/4", 160K bytes or 320K

bytes per diskette Keyboard 83 keys, 6 ft. cord attaches to

10 function keys\* 10-key numeric pad Tactile feedback\* Diagnostics

Power-on self testing\* Parity checking\*

Display Screen High-resolution 80 characters x 25 lines Upper and lower case Green phosphor screen\*

Operating Systems DOS, UCSD p-System, CP/M-86† Languages

BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL system unit\* Printer All-points-addressable

graphics capability Bidirectional\* 80 characters/second 18 character styles 9 x 9 character matrix\*

Permanent Memory (ROM) 40 bytes Color/Graphics

16 colors\* 256 characters and symbols in ROM\* Graphics mode:

4-color resolution: 320h x 200v\* Black & white resolution: 640h x 200v\* Simultaneous graphics & text capability\*

Communications RS-232-C interface Asynchronous or SDLC protocols Up to 9600 bits per second

\*ADVANCED FEATURES FOR PERSONAL COMPUTERS

Remember that these function keys make your program more "friendly" to the user and, therefore, more appealing to us.

In fact, if you're interested in licensing your software, we could be interested in publishing it.

We could also be interested even if it runs on another computer. If we select your software, we'll ask you to adapt it to our system.

So if you think your software is close to picture perfect, consider sending it in.

> For information on how to submit your completed program, write: IBM Personal Computer, External Submissions, Dept. 765 PC, Armonk, New York 10504.

# The IBM Personal Computer A tool for modern times

# Problem Oriented Language

# Part 3: Assembling the Modules

The modules are assembled into a complete programming system.

Mark Finger 2439 Overlook Circle Lawrence, KS 66044

In parts 1 and 2 of this series (see the December 1982 and January 1983 BYTEs), the concept of Problem Oriented Language (POL) was introduced. POL uses input that incorporates terms normally used in describing a particular problem. These terms are organized into phrases and sentences that resemble English sentences. The input is relatively free of the format restrictions normally associated with question-and-answer or menu input. Much more information can be input with a single entry. A typical entry such as "Draw an XY graph, X from 0 to 4, Y from -2 to 3, Title 'Contour Plot,' Execute" would replace dozens of responses required for other types of input. POL-type input is normally used in technical or graphics applications, where many possible parameters can be changed, but only a few need to be set at any given time.

The Problem Oriented Language Programming System (POL/PS) was introduced to provide microcomputers with the capability of handling POL, especially in terms of solving technical problems. The series of routines (POL-80) for handling POL input was presented and the capabilities were examined.

The actual use of the routines within POL/PS was discussed, showing the steps involved in writing a module to find the root of an equation.

# Modularity

I have heretofore covered in some detail the concept of POL and how to program using POL-80 routines. The real key to success in using the POL/PS, however, lies in modular programming.

# What Is a Module?

We often hear that good computer programs are modular. Every programming course and textbook stresses that point. But what makes a program modular? Would you recognize a module if you saw one?

The dictionary definition of a module is "any of a set of units designed to be arranged or joined in a variety of ways." This shows that the key concepts of modularity are flexibility and similarity at the boundaries. A functional definition of a module is simply this: "A module should do one thing and do it well."

The idea in modularity is that units can be chosen and linked together *in* order to reach a goal. One example of

this is the way most kitchens are built using modular cabinets. Each type of cabinet handles a specific task well, and we choose a certain combination of types to best achieve our overall objectives.

When a programmer writes a modular program, a number of units, segments, or sections will be in the program, each having a specific task to perform in achieving the program's goal. These units are linked together by a mainline program (the highest level of control). This concept of modular programming is a tremendous aid in debugging but is very difficult to learn. To get some idea of how modules can be used in programming, let us examine some of the different types.

Programming modules differ mainly in the *level* at which they do their "one thing." The first, and lowest, level is best shown by the one-line functions (or modules) of FORTRAN and BASIC. These modules use a single equation to return a single value. Obviously, they do just one thing.

The best example of second-level modularity is the FUNCTION sub-program in FORTRAN. It does more complex work on its input, but it



**SANYOPLUS** 



"It would be hard to find a more powerful or sophisticated desktop computer within the price range of the Sanyo."

The best deal in a dual drive 64K Z-80 system, now only \$1995. We thoroughly integrate and test each system and warranty each Sanyo Plus for 90 days.

We are so confident of Sanyo's inherent reliability and our pretesting that we will warranty the entire system for a full year for only \$99.

The Sanyo Plus consists of a Sanyo MBC-1000 computer with a built-in 12" high-res, green phospher 25x80 display. The detached keyboard features 5 special function keys and a 10-key pad. The Sanyo Plus comes complete with a parallel printer port, a serial communications port and room for three additional cards

Plus we've added a second drive to give you a total formatted disk capacity of 624K.

Plus you get over \$1100 worth of software including CP/M® 2.2, Wordstar 3.0 with training guide, Sanyo Basic-a superser of Microsoft Basic with diagnostics and utilities, CalcStar® - the spreadsheet that works with Wordstar, and a disk with 20 games.

Plus we generate work copies of all your software.

Special Offer: 5 module business software pack: \$99.

No Dealers please, F.O.B. Scottsdale

Sanyo Minus: Same as the Sanyo Plus with 1 drive ......

\$1649

# TELEVIDEO

### ALTOS

to The Source TM



Our tech's fovorite systems. From the lowest priced 3-user systems with either 2 or 6 MG, storage, to 40MG, 8-user 16 bit systems.

Add terminals, printers, and software and we can fully test and configure your system at low prices. Back nationwide by Moore Systems Service.

| by Mobile Systems Service.     |         |
|--------------------------------|---------|
| Series 5-15D                   | \$2195  |
| Series 5-5D                    | \$3995  |
| Series 5-86-2                  | \$3395  |
| 8000-10                        | \$5575  |
| 8600-12                        | \$9465  |
| Series 5, 8000, systems inclu- | de MP/M |

### ZENITH

# IBM-PC Compatible

Introducing the Zenith Z-100, its the new 8/16 bit system thats CP/M, PC-DOS, and S-100 compatible. Plus it's backed by 300 Zenith service centers nationwide.

Two built-in 320K 5 1/4" drives, 128K RAM, optional color graphics with control of eight colors and 144,000 dots, five 5-100 expansion slots, and a full feature

| Z120          | call   |
|---------------|--------|
| Z110          |        |
| Z-90-82 w/64K | \$2275 |

# NORTHSTAR



Prices now include free burn and rest. We warranty each unit for 90 days from the day you receive ir (not 90 days from the day we receive it). Call for prices on compatible software and hardware.

| 64K Quad         | \$2769 |
|------------------|--------|
| Horizon 64K Quad | \$2695 |
| Advantage        |        |
| w/5 Mb           | \$3795 |

PRINTERS

\$469 \$409 \$649

\$995

call

\$739

\$649

\$1329 \$1469

\$1369

\$1249

\$1495 \$2149

\$1895

Call

NEC8023A

Tally 160L w/TRAC

TI810's

Okidata 82A Okidata 83A

Okidata 84AP

Epson MX 80, 100 Gemini 10, 15

Prism 80 "Loaded" Prism 132 "Loaded"

DataSouth DS-180

Anadex 9501A

Microprism 80

HIGH SPEED

LETTER QUALITY NEC 3510, 30 ..... NEC 7710, 30 .....

# **TERMINALS**

Now backed locally by T.R.W. Built-in CRT, detachable keyboard, dual floppys w/750K formatted capacity, 64K, CP/M and more. Special: Telesolutions — Wordstar TM and CalcStar TM w/system

\$2669 \$5149

\$3495

\$5495 \$6298

802 w/CP/M® ...... 806 (20 Mb) .....

TS 1602G

1602GH

816 (23 Mb) 800A's



Viewpoint 3A Plus: New Viewpoint emulates Lear Siegler, Televideo, or Soroc. We're selling them at a lower price than others charge for older models.

|                       | \$489   |
|-----------------------|---------|
| Zenith ZT-11          | \$559   |
| Televideo 910         | . \$579 |
| Televideo 925         | . \$735 |
| Televideo 950         | . \$927 |
| Zenith Z-19           | . \$689 |
| Adds Viewpoint        | . \$489 |
| Wyse WY-100           | . \$765 |
| Soroc IQ 130          | . \$599 |
| Adds Viewpoint 60     | . \$724 |
| Hazeltine Espirit     | . \$499 |
| Hazeltine Espirit II  |         |
| Hazeltine Espirit III | call    |
| 'with built-in modem  |         |

# Scottsdale Systems Ltd.

617 N. Scottsdale Road, Suite B. Scottsdale, Arizona 85257

I/O DEVICES

**(602) 941-5856** 

Call 8-5 Mon.-Fri.

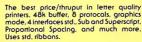
# SERVICE/ORDERING

INTEGRATION: Prices listed are for new equipment in factory sealed boxes with manufacturer's warranty. We will prefest your equipment, integrate your system, configure your software, provide special cables, etc., for an additional charge. Call for prices.

ORDERING: MAIL ORDER ONLY, Prices listed are for cash. No C.O.D.'s. We sell on a net 20 basis to Fortune 500 componies and Universities Charge cards add 2% Prices subject to change, product subject to availability. AZ. residents add 5% Personal checks take 3 weeks to clear. O-20% restocking fee for returned merchandise. Shipping extra - products are F.O.B. point of shipment. CP/M and MP/M are registered trademarks of Digital Research.

SOFTWARE: We sell all popular CP/M® programs at discount. Software sold only with systems not warrantied for sultability.

# **DAISYWRITER 2000**



\$1014



Qume 9/45 .....

| Houston Instrur | ments: |
|-----------------|--------|
| Hi-Pads         | call   |
| DMP-29          | \$1569 |
| DMP-40          | \$745  |

| Hoyes:         |       |
|----------------|-------|
| 300 Smartmodem | \$219 |
| 300/1200       |       |
| Smartmodem     | call  |

should, essentially, do just one thing because it returns just one value. A good example of this type of module in POL-80 is subroutines 750, 800, 850, and 950 (see part 1). Their one thing is to test for a certain situation and return one primary value, the value of FLAG, which indicates a successful or an unsuccessful test. Certainly, they perform a number of actions (especially subroutines 850 and 950, which must carry out a variety of tasks to extract and examine numbers), but they do only as much as is needed to accomplish their one thing.

The third level of modularity involves the return of multiple values, as is often done in subroutines in FORTRAN or BASIC. Examples include subroutines to do the inversion of a matrix or to solve a series of simultaneous equations. These modules still do just one thing.

At higher levels of modularity, the module may be a section of a major program. In my field—chemical engineering—we speak of thermodynamic modules, meaning a group of subroutines that compute temperature, pressure, and other values according to some set of equations. There will be a module for each different model (set of equations) that we use. Some large engineering systems may have five or more thermodynamic modules. The one selected will depend on the chemicals being used or on some similar criteria.

These four levels of modules should cover most ordinary programming. It should be possible to write any given program by simply linking together various levels of modules to accomplish a desired task.

# Why Use Modules?

What good are modules? Why is there all this stress on them? Why should you bother to spend all this extra time writing modular programs if all you get is a little less time spent on debugging? Modular programming has several advantages:

• It can reduce a program's size. Calls to a single module from different places in a program are preferable to writing the same lines of code again and again.

- A good module will be portable. This can reduce the amount of writing that a programmer will need to do because major portions of code are available from previous programs. This is especially true when using graphics and numerical methods.
- A library of standard functions may be available, again reducing the load on the programmer.
- A good module will provide ease of insertion into a program, reducing the programming load.
- •Good modular programming eases debugging because the modules have definite boundaries and only certain pieces of information cross the boundaries. A programmer can be reasonably sure that if one value is being changed, another value 500 lines away is not accidentally being changed.
- •Modular programming's main advantage is to reduce the total programming time to solve a problem—often making the difference between solving a problem on time or not solving it at all.

# The main advantage of modularity is to reduce the total programming time to solve a problem.

The trouble with using a module is discovering how to make it fit in your own program. The major cause of this trouble is controlling the number of parameters that must be passed back and forth between the mainline program and its modules. I have often written my own code rather than use a module I have in my library simply because I must keep track of 12 or more parameters, half of which are not needed in my application. The heart of the trouble lies in the amount of information interchanged. The more information that passes across the module's boundary, the more the rest of the program has to handle. One, two, or three pieces of information are desirable. Twelve to twenty are not, because you have to ensure that each of these values is set properly every time you call the module. In addition, nearly all the information is numerical, and it's difficult to remember whether FLAG=1 means invert the matrix or solve simultaneous equations. Or is it NINV=1? Many lines of code are required to set parameters or check them each time a module is used. This can be a burden to any programmer.

In addition, the mainline program is forced to do nearly all the input, output, and decision making. Setting all the parameters for each subroutine call can mean lots of program lines. Handling input and output adds more lines. Because most mainline programs are written to solve only one problem at one time, very little of the mainline program is reused after all the effort put into it.

# Introducing Extended Control Structure

A solution to this problem is extended control structure. This involves putting some of the input, output, and decision making in the modules or subroutines rather than in the mainline program. The input for a graphics module should be in the graphics module, the input for a rootfinding module should be in that module, etc. This is seldom done in question-and-answer input, and infrequently done in menu input. However, POL input can excel at this. In part 2, I showed that nearly all the input for the root-finding module ROOTs could be placed within the module. This means that only a call to ROOTs is needed in the mainline program-just a couple of simple, standard statements. Other modules for numerical analysis and graphics are constructed in a similar manner. Now, writing code to handle the input is no longer a major concern of the programmer. Output is handled in a similar manner, thus reducing even more of the load. The programmer's only concern with output will be if text output to the printer is to be formatted in a specific manner.

All that remains for a mainline program to do is link modules together and handle decision making. Therefore, let us see how a program for doing numerical analysis can be arranged. The program in listing 1 appears short compared to ROOTs and

# Significant



# THE LOWEST PRICES ON



DOT MATRIX PRINTER

# IN THE ENTIRE GALAXY\*



CALL: (303) 279-2848

(800) 525-7877

THE COMPUTER LINE, INC.

Golden, Colorado

\*Offer void outside the Milky Way

Circle 115 on inquiry card.

Listing 1: Functioning as the mainline program, NUMRANAL will perform a numerical analysis by calling other modules to handle input, output, and decision making. Lines beginning with an asterisk (used for illustrative purposes only) can be eliminated unless those modules are used.

```
3000 REM MAINLINE NUMERICAL ANALYSIS(NUMRANAL)
3010 GOSUB 1450
3020 PRINT "Type VOCAbulary if you want a list of command words."
3100 FART=1
 : AART (@) = "A "
 :AART(1)="AN "
 :AART(2)="THE "
 :AART(3)="IS "
 : AART (4) = "ARE '
 :AART(5)="EQUALS "
 : AART (6) = "EQUAL
 :AART (7) = "AND "
 :AART(A) = "FOR "
 :AART (9) ="OF
 :NART=9
 :FCOM=1
 : ACOM (A) = ".
 :ACOM (1) = "="
 :GOSUB 1050
3110 AM=AP
 :NLET=1
 :GOSUB 750
 :IF FLAG=1
 THEN IRET=9100
 :GOTO 100
Graphics Routines Calls (standard calls)
*3200 AM="DRAW"
 :NLET=4
 :GOSUB 750
 : IF FLAG=@
 GOTO 3300
*3210 GOSUB 3800
 :IF FLAG=0
 GOTO 3100
*3220 AM="CONTINUE"
 : NI FT=4
 :GOSUB 750
 :IF FLAG=1
 THEN ISTART=3004
 ELSE ISTART=3000
*3230 GOSUB 9000
 :CHAIN MERGE APLT+ACOOR, ISTART, DELETE 3000-9999
*3300 AM="REDRAW"
 :NLET=4
 :GOSUB 750
 :IF FLAG=0
 GOTO 4000
*3310 GOSUB 3800
 :IF FLAG=0
 GOTO 3100
*3320 AM="CONT"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN ISTART=3004
 ELSE ISTART=3002
*3330 GOTO 3230
 :NLET=3
 :GOSUB 750
 :IF FLAG=1
 THEN ACOUR="XY"
 :RETURN
*381@ AM="POLAR'
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN ACCOR="POL"
 :RETURN
*382@ AM="CARTESIAN"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN ACOOR="CAR"
 *RETURN
*3990 NERR=1501
 :GOSUB 1200
 : RETURN
4ଉଉଡ AM="ROOT"
 :NLET=4
```

the multiple-page graphics modules. Much of the program is just a series of calls to modules that can then handle the input, output, and decision making. Each of these calls is a standard sequence of statements. The call to ROOTs is in line 4000 and is in the standard format. Additional numerical methods are easily added to this mainline program. Line 4010, for example, is the entry for the CONTour plotter module. Other planned modules for this general-purpose numerical-analysis package include numerical integration, differential equation solving, simplex optimization, and regression (curve fitting). Inserting these modules into this mainline program (or any other) can be as simple as the lines calling for ROOTs and CONTours.

The graphics section (lines 3200-3990) may look long and messy, but this is because it handles three different types of axes (XY, Cartesian, and polar) and three entry points for each type of axis (DRAW, REDRaw, and CONTInue). These statements would be the same for any package that this graphics module would be added to.

The mainline program I have presented treats numerical methods in a general manner. It simply makes the different methods available in one package that includes two-dimensional graphics. It links the modules but does not provide any decision-making or information-passing capabilities; these will be added later. Such capacity is sufficient to solve the majority of problems encountered.

These modules can be easily inserted into a new POL/PS mainline program by lifting the program sections to the new mainline program (lines 3200-3990 for graphics, line 4000 for ROOTs, and line 4010 for CONTours). This simple method of adding capability to a program can tremendously decrease programming time and is the main part of what initially attracted me to POL input. It makes my overall job much easier.

# ROOTs as a Module

Listing 1 continued on page 320

I have been calling ROOTs a module, but is it really a module? ROOTs has definite boundaries; all



WHEN AMERICAN BUSINESS HITS THE ROAD, AMERICAN BUSINESS DECIDES ON HILTON.



```
Listing 1 continued:
 :GOSUB 750
 :IF FLAG=1
 THEN GOSUB 9000
 :CHAIN MERGE ADISK+"NUMRROOT", 3000, DELETE 3000-9999
*4010 AM="CONTOURS
 :NLET=5
 GOSLIE 750
 :IF FLAG=1
 THEN GOSUB 9000
 :CHAIN MERGE ADISK+"NUMRCONT". 3000. DELETE 3000-9999
8970 AM="STOP"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN STOP
8980 GOSUB 1250
 **Standard call for HELP
 and VOCAbulary (include
 :IF FLAG=1
 GOTO 3100
 in every mainline)
8990 NERR=1502
 :GOSUB 1200
 :GOTO 3100
Standard Subroutines for Calls and Returns
9000 IRET=9010
 : ARET=ADISK+"NUMRANAL
 :GOSUB 1400
 : RETURN
9010 GOSUB 1450
:GOTO 3100
9100 GOSUB 1480
 :GOTO 3100
Remember--all modules (including the mainline) must end with line number 9999
9999 REM END APPLICATION PROGRAM
Listing 2: The ROOTs program module is used to find the root of a polynomial
equation.
Module ROOTs
3000 REM MODULE ROOTS (NUMRROOT)
3001 REM COPYRIGHT MARK FINGER 1981
*3010 GOSUB 7100
 **Stores return addresses and
 :ON FRUN+1 GOTO 3020.5100.4435
 initializes parameters
 :FART=1
 : AART (0) = "A "
 :AART(1)="AN "
 :AART(2) = "THE "
 :AART (3) = "IS "
 :AART (4) = "ARE "
 : AART (5) = "EQUALS
 :AART (6) = "EQUAL
 : AART (7) = "AND
 :AART(8)="FOR "
 : AART (9) = "OF
 :NART=9
3030 FCOM=1
 :ACOM(0)=".
 : ACOM (1) = "="
 :NCOM=1
Matching on the highest level of the tree structure below ROOTs
3200 AM="USING"
 NI FT=4
 :GOSUB 750
 :IF FLAG=1
 GOTO 4000
3210 AM="START"
 :NLET=4
 .: GOSUB 750
 :IF FLAG=1
 GOTO 4100
3220 AM="MAXIMUM"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 GOTO 4200
3230 AM="EPSILON"
 :NI FT=4
```

contact with the calling program has an entry point at line 3000 and a return at line 3300. All interaction with a calling program flows through these two points. ROOTs does just one thing-it finds the root of an equation. The level of this program is approximately that of a FORTRAN subroutine. This program (listing 2) is much bigger than the FORTRAN subroutine doing the same thing, but the entry in the calling program (see listing 1, line 4000) is much simpler than would normally be the case in FOR-TRAN or BASIC. The module itself is long simply because all the input and most of the output are handled inside it, and there is considerable checking of values before execution. It is important to remember that this module has to be written only once; then it can be placed in a library until the next time it is needed. Thus, the length of this module is not a burden to the person who uses it. Rather, it helps by not requiring as much effort to insert the module into a program.

# Improving ROOTs

ROOTs has one major limitation as presented here: the equation to be solved cannot be more than 230 characters long. This limitation affects less than 10 percent of the possible applications, but solving this problem will present a second major aspect of the extended control structure.

Let us begin by examining the normal methods used to enter the equation under various types of programming. The most typical situation (used in many scientific subroutines packages) requires the programmer to write a subroutine (in BASIC) or a function (in FORTRAN) and insert it into the overall program. ROOTs can then reference this subroutine whenever a value is required. (Note all the GOSUB 9000 references in listing 4 in part 2.) This method has one major problem. In order to change the equation, the programmer must stop the execution of the program, go to an editor, modify the program, and then restart it. This process is undesirable due to the load it places on a programmer, but, unfortunately, it is the most frequently used method.

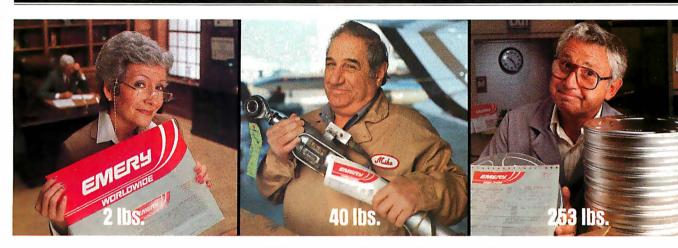
In ROOTs, I have gone one step

Listing 2 continued on page 323

Text continued on page 332

:GOSUB 750

# NO MATTER WHAT YOU SHIP, EMERY IS THE ONE FOR ALL.



No matter what size, no matter where it's going or when it has to be there, there is one shipping company big enough to meet all your needs. Emery Worldwide offers a full range of delivery times—all without weight restrictions. One call to Emery handles it all, all over America.

# EMERY FIRST FLIGHT. THE ONE YOU NEED FOR IMMEDIATE DELIVERY.

If it has to be there right away, Emery First Flight Service gets it there on the first and fastest plane available. For your most urgent shipments, there's no faster Emery service.

# EMERY A.M. THE ONE YOU NEED FOR THE NEXT MORNING.

If time is of the essence, only Emery A.M. Service schedules delivery door-to-door of virtually any size, any weight shipment to most of America the next morning.

# EMERY P.M. THE ONE YOU NEED FOR THE NEXT AFTERNOON.

If time is less critical, Emery P.M. Service delivers door-to-door virtually any size, any weight shipment to most of America the next business afternoon—at a savings.

# EMERY DAY 2. THE ONE YOU NEED WHEN YOU HAVE MORE TIME.

If you have even more time, use Emery Day 2 Service. Your shipment arrives dependably before 5 P.M. on the second business day—at a considerable savings!

# EMERY'S CONTROLLED SHIPPING SYSTEM: BUILT FOR RELIABILITY.

From the time your shipment is picked up until it's delivered on time, it's handled by well-trained Emery personnel using Emery equipment—Emery trucks, Emery planes, and our own Superhub in Dayton, Ohio. It's a system designed for total reliability.

# EMERY'S DISCOUNT SYSTEM. THE ONE YOU NEED FOR IMMEDIATE SAVINGS.

The more you ship, the more you save with Emery's Multiple Shipment Discounts. And best of all, you can receive these discounts immediately, without a qualifying time period.

Ship multiple pieces to one consignee, and save even more, because Emery consolidates them on one airbill and bills you for total shipment weight, not for each piece weighed separately.

# EMERY WORLDWIDE. THE ONE YOU NEED... HERE AND OVER THERE.

In addition to handling all your U.S. shipments, Emery also offers a full selection of services to meet all your international and Canadian shipping needs.

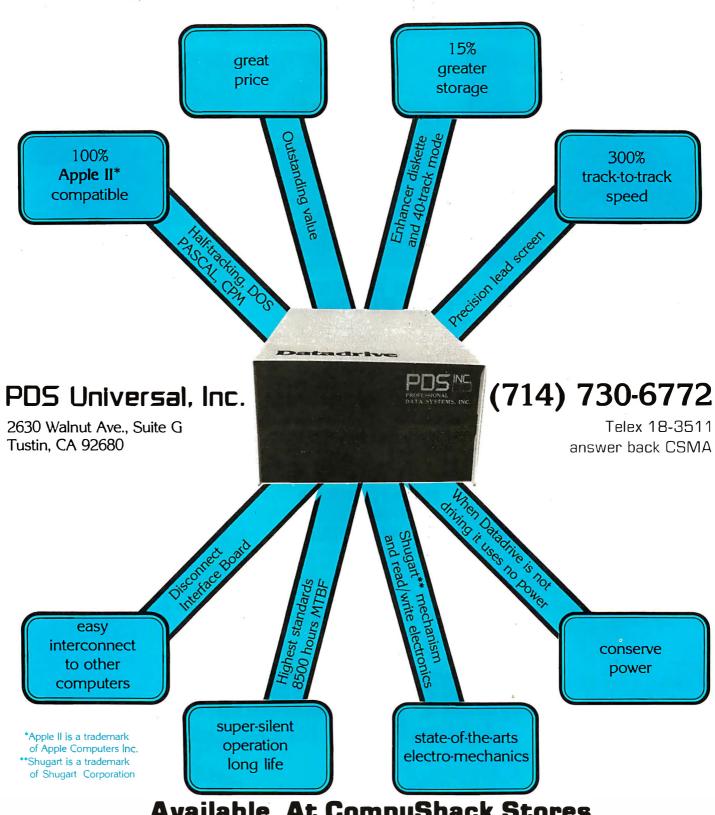
For details on all Emery services, call your local Emery Worldwide office.

**EMERY WORLDWIDE** 

Any size. On time. For sure.



# All Logical Paths Lead to PDS DATADRIVE™ FOR YOUR APPLE II\*

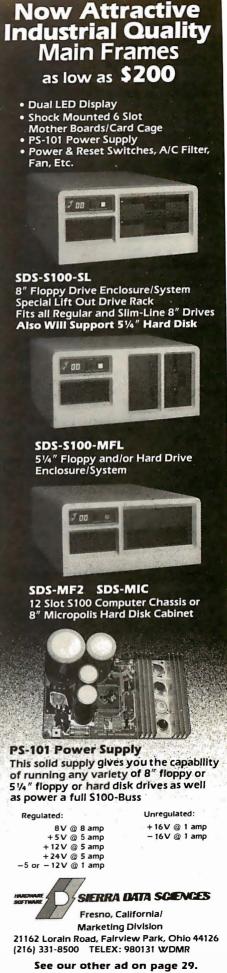


```
Listing 2 continued:
 :IF FLAG=1
 GOTO 4300
3240 AM="VALUE"
 :NLET=4
 :GOSUB 750
 : IF FLAG=1
 THEN FVA=0
 :GOTO 4400
3250 AM="EQUATION"
 :NLET=4
 : GOSHB 750
 :IF FLAG=1
GOTO 4600
3260 AM="DYDX"
 • NI FT=4
 :GOSUB 750
 :IF FLAG=1
 GOTO 4700
3270 AM="EXECUTE"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
GOTO 5000
3280 AM="CLEAR
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 GOTO 4800
3290 IF FCD=0
 THEN NERR=1521
 :GOSUB 1200
3291 IF FCD=1 AND IEOC=0
 THEN NERR=1541
 :GOSUB 1200
3295 FERR=1
3300 GOSUB 7000
 :CHAIN MERGE ARET, IRET, DELETE 3000-9999
Matching for the method under USINg
4000 FCD=1
 :AM="NEWTON"
 :NLET=4
 :GOSUB 750
 : IF FLAG=1
 THEN METHOD%=1
 :GOTO 3200
4010 AM="APPROXIMATE"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN AM="NEWTON"
 :NLET=4
 :GOSUB 750
 :METHOD%=2
 :GOTO 3200
4020 AM="SECANT"
 :NLET=4
:GOSUB 750
 :IF FLAG=1
 THEN METHOD%=3
 :GOTO 3200
4030 AM="INTERVAL"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN AM="HALVING"
 :NLET=3
 :GOSUB 750
 :METHOD%=4
 :GOTO 3200
4040 AM="REGULA"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN AM="FALSI"
 :NLET=4
 :GOSUB 750
 :METHOD%=5
 :GOTO 3200
4050 NERR=1522
 • GOSHB 1200
 :GOTO 3295
Setting the number of STARting POINts and their values
4100 FCD=1
 :FT=1
 :GOSUB 950
 :IF FLAG=1
```

THEN X1=DV

:FSP=1

:GOTO 4150



Listing 2 continued on page 324

```
Listing 2 continued:
411@ AM="POINT"
 :NLET=4
:GOSUB 750
 :IF FLAG=1
 GOTO 4100
4120 AM="AT "
 :NLET=3
 :GOSUB 750
 :IF FLAG=1
 GOTO 4100
4140 NERR=1523
 :GOSUB 1200
 :GOTO 3300
415@ FT=1
 :GOSUB 950
 :IF FLAG=0
 GOTO 3200
4160 X2=DV
 :FSP=2
 :IF X2() X1
 GOTO 3200
4170 FSP=1
 :NERR=1524
 :GOSUB 1200
 :GOTO 3295
Setting the number of MAXImum EVALuations
4200 FCD=1
 :FT=3
 :BB1=2
 :BB2=10000
 :GOSUB A50
 :IF FLAG=1
 THEN NUMEVAL=IV
:GOTO 3200
4210 NERR=1525
Setting the value of EPSIlon
4300 FCD=1
 :FT=3
 :BB1=1E-20
 :BB2=10
 :GOSUB 950
:IF FLAG=1
 THEN EPSILON=DV
 :GOTO 3200
4310 NERR=1526
 :GOSUB 1200
 :GOTO 3295
Returning the value(s) of Y at the requested X('s)
*4400 FCD=1
*4430 AM="AT"
 :NLET=3
 :GOSUB 750
 :FT=1
 :GOSUB 950
 :IF FLAG=1
 THEN FRUN=2
 :FLAGROOT=1
 : X=DV
 : IF FFXT=1
 THEN GOTO 3300
 :ELSE GOSUB 3000
*4435 PRINT "The value at ";X;" is ";Y
 :FVA=1
 :GOTO 4430
*444@ FRUN=@
 :FLAGROOT=0
 :IF FVA=1
GOTO 3200
445@ NERR=1527
 :GOSUB 1200
:GOTO 3295
Entering the EQUAtion
*4600 FCD=1
 :GOSUB 800
 :IF FLAG=0
THEN GOTO 4640
4610 AEQ="9000 "+AB+":RETURN"
 :FEXT=0
 Listing 2 continued on page 326
```

# vobet lle

| Call toda                                                                                                                                                                | у.                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| United States:                                                                                                                                                           |                                                                                                                              |
| Arizona<br>Phoenix                                                                                                                                                       | 602/279-1010                                                                                                                 |
| California<br>(Northern) Mountain View<br>San Francisco<br>Walnut Creek<br>(Southern) Century City<br>Fullerton<br>Los Angeles<br>Newport Beach<br>San Diego<br>Torrance | 415/969-4910<br>415/434-2410<br>415/945-1910<br>213/203-8111<br>714/871-6500<br>213/688-0041<br>714/833-1730<br>619/231-1900 |
| Van Nuys<br>Colorado                                                                                                                                                     | 213/540-7500<br>213/781-4800                                                                                                 |
| Denver<br>Englewood                                                                                                                                                      | 303/571-4450<br>303/773-3700                                                                                                 |
| Connecticut Hartford                                                                                                                                                     | 203/522-6590<br>203/375-7240                                                                                                 |
| Stratford  District of Columbia  Washington D.C.                                                                                                                         | 202/466-5890                                                                                                                 |
| Florida<br>Miami                                                                                                                                                         | 305/624-3536                                                                                                                 |
| Georgia<br>Atlanta (Downtown)                                                                                                                                            | 404/588-9350                                                                                                                 |
| Atlanta (North)<br>Atlanta (Northeast)                                                                                                                                   | 404/953-0200<br>404/325-8370                                                                                                 |
| Illinois<br>Chicago (East Loop)<br>Chicago (West Loop)<br>Oak Brook<br>Rolling Meadows                                                                                   | 312/938-4400<br>312/782-0857<br>312/986-0422<br>312/392-0244                                                                 |
|                                                                                                                                                                          | 317/631-2900                                                                                                                 |
| Kansas<br>Overland Park<br>Kentucky                                                                                                                                      | 913/888-8885                                                                                                                 |
| Louisville<br>Louisiana                                                                                                                                                  | 502/581-9900                                                                                                                 |
| New Orleans<br>Maryland                                                                                                                                                  | 504/561-6000                                                                                                                 |
| Baltimore<br>Towson                                                                                                                                                      | 301/727-4050<br>301/321-7044                                                                                                 |
| Massachusetts<br>Boston<br>Burlington<br>Wellesley<br>Michigan                                                                                                           | 617/482-7613<br>617/273-5160<br>617/237-3120                                                                                 |
| Detroit<br>Southfield<br>Troy                                                                                                                                            | 313/259-7607<br>313/352-6520<br>313/362-0070                                                                                 |
| Minnesota<br>Minneapolis (Downtown)<br>Minneapolis (West)<br>Missouri                                                                                                    | 612/332-6460<br>612/544-3600                                                                                                 |
| Clayton<br>Kansas City                                                                                                                                                   | 314/862-3800<br>816/474-3393                                                                                                 |
| New Hampshire<br>Nashua                                                                                                                                                  | 603/880-4047                                                                                                                 |
| New Jersey<br>Cherry Hill<br>Edison                                                                                                                                      | 609/482-2600<br>201/494 <b>-</b> 2800                                                                                        |
| Morristown<br>Paramus                                                                                                                                                    | 201/267-3222<br>201/845-3900                                                                                                 |
| Princeton New York New York City                                                                                                                                         | 609/452-7277                                                                                                                 |
| (Grand Central)                                                                                                                                                          | 212/557-8611                                                                                                                 |
| (Penn Station)<br>(Wall Street)<br>Rochester                                                                                                                             | 212/736-7445 212/962-8000 716/263-2670                                                                                       |
| Syosset, L.I.<br>White Plains                                                                                                                                            | 716/263-2670<br>516/364-0900<br>914/683-9300                                                                                 |
| Ohio<br>Akron                                                                                                                                                            | 216/535-1150                                                                                                                 |
| Cincinnati<br>Cleveland                                                                                                                                                  | 513/769-5080<br>216/771-2070                                                                                                 |
| Columbus<br>Dayton                                                                                                                                                       | 614/224-0660<br>513/461-4660                                                                                                 |
| Oklahoma<br>Tulsa<br>Oregon                                                                                                                                              | 918/599-7700                                                                                                                 |
| Portland<br>Pennsylvania                                                                                                                                                 | 503/223-6160                                                                                                                 |
| King of Prussia<br>Philadelphia                                                                                                                                          | 215/265-7250<br>215/665-1717<br>412/261-6540                                                                                 |
| Pittsburgh<br>Wilkins Township                                                                                                                                           | 412/261-6540<br>412/247-4400                                                                                                 |
| Texas Dallas (Central) Dallas (North)                                                                                                                                    | 214/954-1100<br>214/387-1600                                                                                                 |
| Dallas (North)<br>Fort Worth<br>Houston (Downtown)                                                                                                                       | 817/338-9300                                                                                                                 |
| Houston (N. Loop West)<br>Houston (S.W. Freeway)                                                                                                                         | 713/751-0100<br>713/957-8555<br>713/626-8705<br>512/342-9898                                                                 |
| San Antonio<br><b>Virginia</b>                                                                                                                                           |                                                                                                                              |
| McLean<br>Washington                                                                                                                                                     | 703/790-5610                                                                                                                 |
| Bellevue<br>Wisconsin<br>Milwaukee                                                                                                                                       | 206/454-6400<br>414/277-0345                                                                                                 |
| Canada:                                                                                                                                                                  | 4171211-0343                                                                                                                 |
| Ontario<br>Don Mills                                                                                                                                                     | 416/425-5730                                                                                                                 |
| Mississauga<br>Toronto                                                                                                                                                   | 416/272-3333<br>416/865-1125                                                                                                 |
| Québec<br>Montréal                                                                                                                                                       | 514/849-7043                                                                                                                 |

# Somehow, Did Your Last Raise Seem Insignificant?



# New, Free Computer Salary Survey!

Learn about compensation in the computer field, including the effects of inflation and recession, and which career paths offer the greatest compensation from a 28-page report prepared by Source Edp.

Despite past inflation and recession, demand for computer systems and the people needed to support them continues to grow.

Computer

Salary Survey and Career Planning Guide

But which professionals, with what specialized experience and skills, are really in the best positions for long term career and salary growth? And is your salary really keeping pace?

In our new Survey, you'll get answers to these questions and much more.

# Compare your salary with many others.

The new Survey not only provides salary medians for 48 position categories, but it also shows "highs" and "lows" for each one as well. Figures are organized by types of professionals, including those ranging from commercial pro-

grammers to management and marketing positions; by experience level and by size of computer installation site. So you'll be able to compare your salary with those computer professionals who have similar responsibilities and skills and to learn who in computing, in what kinds of specialized disciplines, are earning the most.

No other Survey we know of is more comprehensive. It's based on contacts with more than 50,000 professionals and 25,000 organizations.

# Learn about new growth areas.

Most significantly, you'll also read about which specific areas of specialization are forecasted for unusual growth in this decade and beyond. The past year saw many

changes in the economy and has altered career prospects for some professionals who were not properly prepared, so the need to stay abreast of current trends and career planning has never been so critical.

Whatever computer specialty you're in, or plan to explore—programming, software, systems design. data communications, mini/micro systems, data base, computer marketing, sales, management or others-our Survey can help you make the most of your career. You'll be able to keep up with changes in the profession, establish career goals, develop action plans, evaluate your progress, spot potential dangers, take corrective action when needed, and in general, keep your career on the best possible course for growth.

# Call for your free copy.

The new 1983 Computer Salary Survey and Career Planning Guide is available without charge. You owe it to yourself to get a copy of the report—especially if most of your career lies ahead of you.

Call today and our free 28-page Survey will be mailed to you in strict confidence, without obligation.

source 4 Personnel Services

The world's largest recruitment firm that specializes exclusively in the computer profession.

Client companies assume our charges.

# Call today.

Call the office nearest you that is listed to the left. If you're unable to call, write: Source Edp Department B1 P.O. Box 7100 Mountain View, CA 94039

(When writing, be sure to include your title.)

# Verbatim®

Listing 2 continued:

:FDX=@

# Floppy Discs

SAVE 40% Write for our complete list.

| ■ 1/ // Specify soft,                    | Price/10 |
|------------------------------------------|----------|
| 5 1/4 ' Specify soft,<br>10 or 16 sector |          |
| MD525 1 side/dbl dens                    | \$27.30  |
| MD550 2 sides/dbl dens                   | 40.30    |
| MD577 1 side/77 track                    | 37.10    |
| MD557 2 sides/77 track                   | 47.50    |
| 8'' Critically Certified<br>Soft sector  |          |

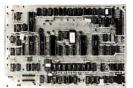
FD34-9000 1 side/sgl dens . . . . . . . . . . . . . . . . 33.80 FD34-8000 1 side/dbl dens. . . . . . . . . 39.00 FD34-4001 2 side/dbl dens . . . . . . . . . 46.20

CHECKS - VISA - MC - C.O.D.(313) 777-7780 ADD \$2 SHIPPING

LYBEN COMPUTER SYSTEMS 27204 Harper Ave St. Clair Shores, MI 48081

Circle 237 on inquiry card.

# ONE BOARD CP/M®SYSTEM FOR NETWORKS



## Features

- 8½ x 12½ inches
   10 MHZ 8085 CPU
- 64K RAM
   880 KBIT/SEC
- CRT Controller
   8272 FD Controller
- Winchester Interface
   2 RS-232 Channels

Documentation \$20 CP/M Floppy Disk Op. System \$180 Check or Money Order

# autocontrol

11400 Dorsett Rd. Maryland Heights, MO 63043 (314) 739-0055

Circle 40 on inquiry card.

CHIELDED DATA CABLES

| SHIELDED DATA CABLES                                                                                                                                                                                              |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| RS 232 Cables up to 9 conductors, specify male/                                                                                                                                                                   |           |
| female ends, length & pin interconnects\$11.00 +                                                                                                                                                                  |           |
| IBM-PC extra heavy duty printer cables (10 ft)                                                                                                                                                                    | S38       |
| TERMINALS                                                                                                                                                                                                         | Feb. Sale |
| Hazeltine List                                                                                                                                                                                                    | Price     |
| ESPRIT I full featured terminal w/green screen \$595                                                                                                                                                              | \$499     |
| ESPRIT II terminal w/detachable keyboard \$645                                                                                                                                                                    | \$565     |
| ESPRIT III televideo 950 emulator                                                                                                                                                                                 | \$775     |
| Televideo 910 + full featured terminal                                                                                                                                                                            | \$569     |
| 925 terminal w/detachable keyboard \$995                                                                                                                                                                          | \$740     |
| 950 graphics terminal w/det. keyboard \$1195                                                                                                                                                                      | \$939     |
| 970 advanced graphics terminal \$1495                                                                                                                                                                             | \$1325    |
| MODEMS                                                                                                                                                                                                            |           |
| Novation J-CAT 0-300 baud Direct connect modem \$149                                                                                                                                                              | \$129     |
| 103 SMARTCAT 0-300 baud auto ans. modem. \$249                                                                                                                                                                    | \$199     |
| 103/212 SMARTCAT 0-300/1200 baud \$595                                                                                                                                                                            | \$525     |
| 212AUTOCAT 0-300 baud/1200 baud modem. \$695                                                                                                                                                                      | \$565     |
| 212APPLECAT II 300/1200 baud modem and                                                                                                                                                                            |           |
| software \$725                                                                                                                                                                                                    | \$599     |
| UDS 212LP telco powered 1200 baud modem \$495                                                                                                                                                                     | \$395     |
| PRINTERS                                                                                                                                                                                                          |           |
| OKI-DATA uL82A 91/2" carriage 120 cps printer \$549                                                                                                                                                               | \$399     |
| uL83A 15" carriage 120 cps printer \$899                                                                                                                                                                          | \$650     |
| uL84P 15" carriage 200 cps parallel printer \$1395                                                                                                                                                                | \$999     |
| uL84\$ 15" carriage 200 cps serial printer \$1495                                                                                                                                                                 | \$1099    |
| Certified check, money order or C 0 0 . VISA and Mastercard add 2% F<br>checks may require 2 to 3 weeks to clear. All prices in U.S. dollars. N<br>residents add 4% sales tax. F 0 B. Mt. Clemens. Michigan 48044 |           |
|                                                                                                                                                                                                                   |           |

ELECTROSONICS

P.O. Box 1141 • Mt. Clemens, MI 48044 • (313) 286-6969 Monday-Friday 9 a.m.-5 p.m. est . Saturday 9 a.m.-12 p.m.

```
4620 OPEN "O", #7, "EQUATION. BAS" : PRINT#7, AEQ
 :CLOSE#7
 :CHAIN MERGE "EQUATION", 4630, ALL, DELETE 9000
4630 GOSUB 1480
 :GOTO 3200
*464@ AM="EXTERNAL"
 :NLET=4
 :GOSUB 750
 :IF FLAG=1
 THEN FEXT=1
 :FDX=∅
 :GOTO 3200
*4650 NERR=1533
 :GOSUB 1200
 :GOTO 3295
Entering the derivative of the equation
 (required by Newton's method)

*4700 IF FFXT=1
 THEN NERR=1539
 :GOSUB 1200
 :GOTO 3295
 :ELSE FCD=1
 :GOSUB ANN
 :IF FLAG=∅
 THEN NERR=1534
 :GOSUB 1200
 :GOTO 3295
4710 AEQD="9001 "+AB+":RETURN"
:FDX=1
4720 OPEN "O", #7, "EQUATION. BAS"
 :PRINT#7, AEQD
 :CLOSE#7
 :CHAIN MERGE "EQUATION", 4630, ALL, DELETE 9001
4730 GOSUB 1480
:GOTO 3200
 CLEAring the parameters to default values

4800 FCD=1
 :METHOD%=3
 • ¥ 1 = i⁄i
 :X2=1
 :FSP=2
 :NUMEVAL=20
 :EPSILON=.1
 :AED="9000 Y=X:RETURN"
 :AEQD="9001 YPRIME=1:RETURN"
 :GOTO 3200

EXECution of root-finding

*5003 FCD=1
 :FRUN=1
 ·NEXTSTED=0
5010 IF METHOD%() 1 AND FSP()2
 **Checking for 2 starting points for methods that
 THEN NERR=1535
 :GOSUB 1200
 require 2
 :GOTO 3295
5020 IF METHOD%=1 AND FDX=0
 **Checking for derivative update if Newton's method
 THEN NERR=1536
 :GOSUB 1200
:GOTO 3295
 is used
*5030 (deleted)
5050 NUM=0
*5100 ON METHOD% GOSUB 6000,6200,6400,6600,6800 **Computation loop *5110 Y=0
 :IF FLAGROOT=-1
 GOTO 3295
5200 IF NUM>NUMEVAL
 **Checking if too many
 GOTO 5400
 evaluations
*5210 IF FLAGROOT()3
 **Checking if done
 THEN IF FEXT=0
 **If not done, get value
 THEN IF FLAG=1
 for next calculation
 THEN GOSUB 9000
:GOTO 5100
 :ELSE GOSUB 9001
 :GOTO 5100
 :ELSE GOTO 3300
5220 PRINT "The root is ", XLAST :PRINT NUM; " Evaluations were required."
 **The desired root has been
 found
*5260 FRIN=0
 :GOTO 3200
*5400 PRINT "The root was not found in "; NUMEVAL; " attempts."
 :FLAGROOT=-1
 :NFRR=1540
 Listing 2 continued on page 328
```

# IBM memory at realistic prices:

256 WITH AN RS-232C INTERFACE \$529 WITH SUPERCALC 512 WITH AN RS-232C INTERFACE \$749 WITH SUPERCALC

> Both of these fully-populated memory boards include parity checking and a standard RS-232C interface. They are compatible with all IBM software.

You can expect these boards to meet the highest standards of design and manufacturing quality available — at any price. We are proud to guarantee them fully for a period of two years.

31245 LA BAYA DRIVE WESTLAKE VILLAGE, CA 91362

To order or for information call

In New York: (212) 509-1923

In Los Angeles: (213)706-0333

In Dallas: (214) 744-4251

By Modem: (213) 883-8976

We guarantee everything we sell for 30 days — no returns after 30 days. Defective software will be replaced free. but all other software returns are subject to 15% restocking fee and must be

We accept VISA and MasterCard on all orders; COD orders, up to \$300.

Shipping charges: \$3 for all prepaid orders, actual shipping charges for non-prepaids; \$3 for COD orders under 25lbs. (\$6 for over) plus a \$4 surcharge; add t5% for foreign, FPO and APO orders. Calif. add 6% sales tax. L.A. County add 6½%.

Prices quoted are for stock on hand and are subject to change without notice.

```
5410 PRINT "The last values were X =";XLAST;" and Y =";YLAST
5420 GOTO 3200

```

```
Methods Subroutines
```

```

*6000 IF NEXTSTEP=0
 **Newton's Method
 THEN X=X1
 **Get first point and ask for Y
 :NEXTSTEP=1
 :FLAGROOT=1
 : RETURN
*6010 IF NEXTSTEP=1
 THEN YOTHER=Y
 **Save Y and ask for YPRIME
 :YLAST=Y
 :NEXTSTEP=2
 :FLAGROOT=2
 : RETURN
 **Compute new X value, check
*6020 XLAST=X
 :XOTHER=X
 if done
 :X=XLAST-YLAST/Y
 :NEXTSTEP=1
 :NUM=NUM+1
 :IF ABS(YLAST) (=EPSILON
 THEN FLAGROOT=3
 **Done
 : RETURN
 :ELSE FLAGROOT=1
 **Ask for new Y
 : RETURN
*6200 IF NEXTSTEP=0
 **Approximate Newton's Method
 THEN X=X1
 **Ask for first Y
 :FLAGROOT=1
 :NEXTSTEP=1
 : RETURN
*6210 IF NEXTSTEP=1
 **Store Y and ask for second Y
 THEN XOTHER=X
 :YOTHER=Y
 :X=X+(X2-X1)
 :NEXTSTEP=2
 :FLAGROOT=1
 : RETURN
*6220 NUM=NUM+1
 **Compute new X
 :XLAST=X
 :YLAST=Y
 :X=X-Y/((YLAST-YOTHER)/(XLAST-XOTHER))
 :IF ABS(Y) (=EPSILON
 **Check if done
 THEN FLAGROOT=3
 :RETURN
:ELSE FLAGROOT=1
 **Ask for first new Y
 :RETURN
*6400 IF NEXTSTEP=0
 **Secant Method
 THEN X=X1
 **Ask for first Y
 :FLAGROOT=1
 :NEXTSTEP=1
 : RETURN
*6410 IF NEXTSTEP=1
 **Store Y and ask for second Y
 THEN YLAST=Y
 :XLAST=X
 :X=X2
 :NEXTSTEP=2
 :FLAGROOT=1
 : RETURN
*6420 NUM=NUM+1
 **Calculate new X
 :XOTHER=XLAST
 :YOTHER=YLAST
 :XLAST=X
 :YLAST=Y
 :X=X-Y/((YOTHER-YLAST)/(XOTHER-XLAST))
 :NEXTSTEP=2
 :IF ABS(Y) (=EPSILON
 **Check if done
 THEN FLAGROOT=3
 **Done
 : RETURN
 :ELSE FLAGROOT=1
 **Ask for new Y
 : RETURN
*6600 IF NEXTSTEP=0
 **Interval-Halving Method
 THEN X=X1
 **Ask for first Y
 :FLAGROOT=1
 :NEXTSTEP=1
 :RETURN
*6610 IF NEXTSTEP=1
 **Store Y and ask for second Y
 THEN YOTHER=Y
 :XOTHER=X
 :X=X2
 :FLAGROOT=1
 :NEXTSTEP=2
 : RETURN
*6620 IF NEXTSTEP=2
 **Determine if two X values
 THEN YLAST=Y
 bracket the root
 :XLAST=X
 :IF YLAST*YOTHER) @
 THEN NERR=1538
 No, error
 :GOSUB 1200
 :FLAGROOT=-1
 :RETURN
 :ELSE X=(XLAST+XOTHER)/2
 Yes, so ask for next Y
 :FLAGROOT=1
 :NEXTSTEP=3
 : RETURN
```

CA: Los Angeles (213) 907-1803 Orange County (714) 851-9462 Sacramento (916) 966-8037 San Francisco/Sunnyvale (408) 727-9552

DC: Washington (703) 356-6441

GA: Atlanta \*(404) 952-0919

Chicago IL: (312) 882-8176 (800) 323-5609

MA: Boston (617) 273-5955 \*(617) 229-2800

MI: Detroit (313) 525-8240

MN: Minneapolis \*(612)814-7199

MO: St. Louis (314) 434-4011

NY: New York (212) 687-7122

OH: Cleveland (216) 333-3725

PA: Pittsburgh (412) 261-0406 Philadelphia (609) 939-4762

Dallas/Ft. Worth TX: \*(817) 261-5312

WA: Seattle (206) 455-4725

\*Includes OEM Sales

Dysan Diskettes are also available from all ComputerLand Stores. Sears Business Systems Centers, and many independent computer outlets nationwide.

For the location of the Dysan sales outlet nearest you, contact Dysan at: (408) 988-3472

Toll Free: (800) 538-8133 Telex: 171551 DYSAN SNTA TWX: 910-338-2144



Listing 2 continued on page 331



# WHATISTHE TRUE COST OF A DISKETTE?

If you said at least \$186.50\*, you're probably close.

Confused? It's simple. The minimum cost of a one-sided, single density 8" diskette equals the purchase price plus the cost of the time to fully load the data onto the disc\*. The adjacent diagram tells the story. As you can see, the purchase price of a diskette is a small fraction of the total cost of ownership. So why not pay a few cents more for the best diskette available?

That's where Dysan's quality comes in. Dysan diskettes and mini-diskettes are manufactured to the toughest quality standards in the industry. Every diskette is tested between the tracks as well as on the tracks to insure you 100% error-free recording over the entire disc surface. Dysan quality protects your investment of \$186.50.

You know how costly time and data losses can be should your "bargain" diskette be faulty. Every penny you think you save on the purchase of magnetic media could cost you dearly. Why take the risk when you can have Dysan?





Our Media Is Our Message 5201 Patrick Henry Drive Santa Clara, CA 95050 \*\$4.00 represents
Dysan's suggested
retail price for a one-sided, single
density 8" diskette, packaged ten
to a box. Minimum total cost of
ownership = \$186.50

\*\$182.50 represents the cost of data loading (approximately 22 hours at 11,106 keystrokes/hour at a labor cost of \$8.23/hour), based on 1981 Data Entry Management Association (DEMA) National Averages.

GTE

PERSONAL SOFTWARE

• HITACHI • HAYDEN • CANON • NOVATION • D.C. HAYS MICROCOMPUTERS • PAPER TIGER

**BUSINESS WORLD INC** Information Line (213) 996-2252 TOLL FREE MAIL ORDER LINES (800) 423-5886 Outside Calif

# LE MONITOR

9" GRN PHS 12" GRN PHS

**OUR PRICE** 88.00 Save \$101.00

**OUR PRICE** 

MSL 189.00 119.00 aug METAL \$70.00 CABINET Add a Genie in Your Computer Intelligent Printer Interface Card Works With Integer Basic Applesoft\*

Pascal 1.0 & 1.1

SPECIAL OF THE MONTH GRAPHICS

CP/M\*

**OUR PRICE** \$99.00

MSL 159.00 \*Applesoft is a registered Trademark of Apple Computer, Inc.
\*\*CP/M is a registered trademark of Digital Research.

퓽

6

O

HAYS MICRO

COMPUTERS

PAPER TIGER

GIE

DIABLO

BMC

CENTRON

# **MICRO-SCI**

# APPLE II+ COMPATIBLE DRIVE

W/ CONTROLLER W/O CONTROLLER MSL OUR PRICE MSL OUR PRICE 429.00 549 00 449.00 379.00

COMPARE TO COMPARE TO
APPLE DRIVE 216.00 APPLE DRIVE APPLE IS A REG. TRADE MARK OF APPLE COMPUTER

# IBM **PERSONAL** COMPUTER INCLUDES

2 Drives DS/DD Color Graphic Board 64K Memory GRN PHS

Save **OUR PRICE** \$2995.00 410.00 3305.00 •Subject to availability



APPLE IS A REG. TRADEMARK OF APPLE COMPUTER

RADIO SHACK

# THE APPLE COMPATIBLE **ALTERNATIVE** BUSINESS SYSTEM

Franklin Ace 1000 system • 64K • Disk Drive with controller card • 12" green phs. video monitor. Color optional \$49.00

S1395.00

SAVE \$1000 COMPARED TO APPLE SYSTEM

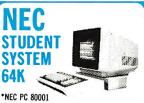
# OSBORNE PERSONAL COMPUTER



INCLUDES SOFTWARE

- CPM MAIL MERGE • WORDSTAR • CB BASIC
- SUPERCALC M BASIC

MSL OUR PRICE Save \$200.00 1795.00 **1595.00** 



\*NEC PC 8012 \*NEC PC 8031 12" Grn. Phs. Video Monitor

IBN **PERSONAL** 

COMPUTER

MSL OUR PRICE Saw 744.00 2839.00 **\$2095.00** 

# TRS 80 MOD III 2 DRIVE **RS232**

OUR PRICE Save MSL 2495.00 **\$1733.00** 762.00

# **SMITH CORONA** DAISY WHEEL PRINTER

Letter Quality



OUR PRICE \$599.00

MSL 895.00

Save 296.00

12M

645.00

745.00

995 00

649.00 995.00 1495.00

1795.00 1377.00

Our

Price

Call

1177.00

Our Price

PERSONAL

SOFTWARE

ADDS

XEROX

DIABLO

|   |                                           |          |        | ı |
|---|-------------------------------------------|----------|--------|---|
|   | APPLE                                     |          |        |   |
|   | ACCESSORIES                               | MSL      | Our    |   |
|   | Videx Combo Package                       | 375.00   |        |   |
|   | Videx Videoterm Card                      | 345.00   |        |   |
|   | Videx Keyboard Enhancer II                | 149.00   |        |   |
|   | Microsoft Softcard with CP/M              | 345.00   |        |   |
|   | Microsoft Premium Pak                     | 685.00   |        |   |
|   | Microsoft 16K Card                        | 99.95    |        |   |
|   | PCP Appl I - Card (4 MHZ version          |          |        |   |
|   | PCP Appl 1 - Card (4 MHZ version          | 595.00   |        |   |
| ı | Corvus Winchester 5MB                     | 2,495.00 |        |   |
| ı | Corvus Winchester 10MB                    | 3,495.00 |        |   |
| ı | Corvus Winchester 20MB                    | 4,495.00 |        |   |
| ı | Saturn Systems 32K                        | 249.00   |        |   |
| ı |                                           | 425.00   |        |   |
|   | Saturn Systems 64K<br>Saturn Systems 128K | 599.00   |        |   |
|   | Havs Micromodem II                        | 379.00   |        |   |
| ı | Hays Smartmodem                           | 279.00   |        |   |
| ı | Kensington System Saver                   | 90.00    |        |   |
| ı | M & R RF Modulator                        | 30.00    |        |   |
| ١ | M & R Super Fan                           | 50.00    |        |   |
| ı | Grappler +                                | 175.00   |        |   |
| ı | Practical Peripherals                     | 173.00   | 100.00 |   |
| ı | Microbuffer II 16K                        | 259.00   | 225.00 |   |
| ı | Practical Peripherals                     | 233.00   | 223.00 |   |
| ı | Microbuffer II32K                         | 299.00   | 239.00 |   |
|   | Prometheus Versa Card                     | 199.00   |        |   |
|   | SVA Disk 2+2 Controller DSSD              | 395.00   |        |   |
|   | SVA Disk 2+2 Controller OSDO              | 595.00   |        |   |
|   | SVA App-L-Cache 256 K Memory              |          |        |   |
|   | TG Joystick                               | 59.95    | 24.00  |   |
|   | TG Select-A-Port                          | 59.95    |        |   |
|   | Wesper Micro Wizard 80                    | 249.00   | 179.00 |   |
|   | Wesper Micro BPO 16K                      | 179.00   |        |   |
|   | Wesper Micro BPO 32K                      | 219.00   |        |   |
| ١ | Wesper Micro SOB 16K                      | 249.00   |        |   |
| ١ | Wesper Micro SOB 32K                      | 279.00   |        |   |
| ı | BMC 1401 w/RGB Interface                  | 595.00   |        |   |
| l | At S 7. Card w/CPM for Apple II           | 349 00   |        |   |

| ١ |                                                                        |                      |          |
|---|------------------------------------------------------------------------|----------------------|----------|
|   | APPLE                                                                  |                      |          |
|   | ACCESSORIES                                                            | MSL                  | Our      |
|   | Videx Combo Package                                                    | 375.00               |          |
|   | Videx Combo Package Videx Videoterm Card                               | 345.00               | 239.00   |
|   | Videx Videoterm Card<br>Videx Keyboard Enhancer II                     | 149.00               | 115.00   |
|   | Microsoft Softcard with CP/M                                           | 345.00               | 235.00   |
|   | Microsoft Softcard With CP/M<br>Microsoft Premium Pak                  | 685.00               | 469.00   |
|   | Microsoft Premium Pak<br>Microsoft 16K Card                            | 99.95                | 72.50    |
|   | PCP Appl I - Card (4 MHZ version)                                      |                      |          |
|   | PCP Appl I - Card (4 MHZ version)<br>PCP Appl I - Card (6 MHZ version) | 595.00               | 449.00   |
| ı |                                                                        | 2.495.00             | 1.949.00 |
|   |                                                                        | 2,495.00<br>3,495.00 | 2,849.00 |
| ı |                                                                        | 3,495.00<br>4,495.00 | 3,699.00 |
| ı |                                                                        |                      |          |
| ı | Saturn Systems 32K                                                     | 249.00               | 165.00   |
|   | Saturn Systems 64K                                                     | 425.00               |          |
| ı | Saturn Systems 128K                                                    | 599.00               | 452.00   |
| ı | Hays Micromodem II                                                     | 379.00               |          |
| ı | Hays Smartmodem                                                        | 279.00               |          |
| 1 | Kensington System Saver                                                | 90.00                |          |
| ١ | M & R RF Modulator                                                     | 30.00                |          |
| ١ | M & R Super Fan                                                        | 50.00                |          |
| ١ | Grappler +                                                             | 175.00               | 135.00   |
| ١ | Practical Peripherals                                                  | 050.00               | 005.00   |
| ١ | Microbuffer II 16K                                                     | 259.00               | 225.00   |
| ١ | Practical Peripherals                                                  |                      | 000.00   |
| ١ | Microbuffer II32K                                                      | 299.00               |          |
| ١ | Prometheus Versa Card                                                  | 199.00               |          |
| ١ | SVA Disk 2+2 Controller DSSD                                           | 395.00               |          |
| ١ | SVA Disk 2+2 Controller OSDO                                           | 595.00               | 489.00   |
| ١ | SVA App-L-Cache 256 K Memory                                           |                      |          |
| ١ | TG Joystick                                                            | 59.95                |          |
| ı | TG Select-A-Port                                                       | 59.95                |          |
| ı | Wesper Micro Wizard 80                                                 | 249.00               |          |
| I | Wesper Micro BPO 16K                                                   | 179.00               |          |
| ı | Wesper Micro BPO 32K                                                   | 219.00               |          |
| I | Wesper Micro SOB 16K                                                   | 249.00               |          |
| ١ | Wesper Micro SOB 32K                                                   | 279.00               |          |
| I | BMC 1401 w/RGB Interface                                               | 595.00               |          |
| ١ | ALS Z-Card w/CPM for Apple II                                          | 349.00               |          |
| Ļ |                                                                        |                      |          |
| ĺ |                                                                        | - To                 |          |
|   | 7                                                                      | 4: 30.               |          |

IZM.

\$ 250.00 250.00 200.00

125.00

260 00 197.00

180.00 150.00



| Infocom Deadline               | 35.00                   | 27.00            |
|--------------------------------|-------------------------|------------------|
| Innovative T.I.M. III (a DBMS) | 450.00                  | 355.00           |
| ISM Mathmagic                  | 75.00                   | 65.00            |
| Info Unlimited                 |                         |                  |
| Easy writer II                 | 350.00                  | 269.00           |
| Phone Support of Easywriter II | 350.00                  | 260.00           |
| Easyspeller (88K words)        | 150.00                  | 119.00           |
| Easyfiler (aDBMS)              | 400.00                  | 289.00           |
| Micro Pro Wordstar             | 495.00                  | 229.00           |
| Sorcim Superwriter             | 395.00                  | 289.00           |
| Super Calc                     | 295.00                  | 189,00           |
| Visicorp Visicalc              | 200.00                  | 155.90           |
| Visical c/256 K                | 250.00                  | 189.00           |
| Desklop Plan I                 | <b>30</b> 0. <b>0</b> 0 | 240.00           |
| VisiTrend/Plot                 | 300 00                  | 240,00           |
| VisiDex                        | 250.00<br>250.00        | 199.00<br>199.00 |
| VisiFile                       |                         | 199.00           |
| VersaWriler Graphics Tablet    | 299.00                  | 255.00           |
| Conquest                       | 29.95                   | 24.00            |
| Frogger                        | 34.95                   | 29.00            |
| The Tax Manager                | 250.00                  | 199.00           |
| Galaxy                         | 25.00                   | 21.00            |
| Mid way Campaign               | 21.00                   | 17.95            |
| Computer Stocks and Bonds      | 25,00<br>25.00          | 21.00            |
| Voyager<br>Draw Poker          | 21.00                   | 21.00<br>17.95   |
| Lost Colony                    | 21.00                   | 23.95            |
| Lost Colony                    | 21.33                   | 23.93            |
|                                |                         |                  |
|                                |                         |                  |
| MONITORS                       |                         |                  |
| MOMITORO                       |                         | Our              |
| BMC                            | List                    | Price            |
| 12" Grn. Phs KQ (15 MHz)       | 219.00                  | 139.00           |
| 12" Grn. Phs EO (18 MHz)       | 249.00                  | 149.00           |
| 12" Grn. Phs (20 MHz)          | 279.00                  | 169.00           |
| 12" Color Composite Hi Res.    | 439.00                  | 289.00           |
| NEC Grn. Phs 12"               | 225.00                  | 175.00           |
| Zenith 12"                     | 159.00                  | 119.00           |
|                                |                         |                  |
|                                |                         |                  |

| HEWLETT PACKARD            |        |        |
|----------------------------|--------|--------|
| HP-11C Slim-Line Advanced  | 135.00 | 119.00 |
| HP-12C Slim-Line Financial | 150.00 | 129.00 |
| HP-41 CV New 2.2           | 100.00 | 120,00 |
| Bytes Mem                  | 275.00 | 209.00 |
| HP 15C Adv Prog Calculator | 135.00 | 109.00 |
| HP 16C Adv Financial Calc  | 150.00 | 119.00 |
| Card Reader For 41CV/C     | 215.00 | 162.00 |
| Printer For 41CV/C         | 385.00 | 289.00 |
| Optical Wand For 41 CV/C   | 125.00 | 97.00  |
| Quad Ram Equals            |        |        |
| 4 Mem. Mods                | 95.00  | 81.00  |
| HP-97 Programble Printer   | 750.00 | 595.00 |
| HP-67 Programble           |        |        |
| Calculator                 | 375.00 | 295.00 |
| HP-34C Programble          |        |        |
| Scientific                 | 150.00 | 117.00 |
| HP-38C Programble          |        |        |
| Bus. R/E                   | 150.00 | 117.00 |
| HP-32E Adv. Scientific     | 55.00  | 48.00  |
| HP-37E Business Mgml.      | 75.00  | 57.00  |
|                            |        |        |
| ALCHUTODO.                 |        | 1      |
| MONITORS                   |        |        |
|                            |        |        |

| W N COL                  |        |        |
|--------------------------|--------|--------|
| MONITORS                 |        |        |
| NEC                      |        |        |
| Nec 12" Hi Res           | 210.00 | 165.00 |
| Green Monitor            |        |        |
| Nec 12" Composite        | 449.00 | 345.00 |
| Color Monitor            |        |        |
| SANYO                    |        |        |
| Sanyo 9" B & W           | 225.00 | 165.00 |
| Sanyo 9" Green Monitor   | 225.00 | 169.00 |
| Sanyo 12" B & W          | 275.00 | 185.00 |
| Sanyo 12" Green          | 320.00 | 249.00 |
| (New Case Style)         | 400.00 | 350.00 |
| Sanyo 13" Color Monitor  | 489.00 | 359.00 |
| ZENITH                   |        |        |
| Zenith 12" Green Monitor | 159.00 | 119.00 |
|                          |        |        |

| PRINTERS  EPSON Epson MX-80 T Type III w/graphics Epson MX-800/T Type III w/graphics Epson MX-100 Type III w/graphics        |
|------------------------------------------------------------------------------------------------------------------------------|
| OKIDATA Okidata 82A w/lractor 80 col Okidata 83A W/tractor 132 col Okidata 84A 132 col. serial Okidata 84A 132 col. parallel |
| C. ITOH C. Itoh F 10 40 cps (parallel) C. Itoh F 10 40 cps (serial) C. Itoh Prowriter (parallel) C. Itoh Prowriter (serial)  |
| DRIVES                                                                                                                       |

| DRIV  | ES            |      |        |
|-------|---------------|------|--------|
| 51/4" | <b>FLOPPY</b> | DISK | DRIVES |
|       |               |      | шс     |

Single Sided \$295.00 48TP1 \$199.00 For the IBM Personal Tan-don TM 10D-1 For IBM/North-395.00 279.00 star/Cromemco Tandon TM1 00-2 **51/4" WINCHESTER DRIVES** Seagate ST 506 Seagate ST 412 Tandon TM 602 Tandon TM 603 1500.00 1750.00 1395.00

9.6Mb 1500.00 1179.00 WE RESERVE THE RIGHT TO CORRECT TYPOGRAPHICAL ERRORS, THIS AD SUPERCEDES ALL PREVIOUS ADS. PRICES SUBJECT TO CHANGE WITHOUT NOTICE. Telex: 182852 Answer: MICKO TZNA



| <i>-</i> |      |       | tate _ | Zip_        |       |       |
|----------|------|-------|--------|-------------|-------|-------|
| ty       | Make | Model |        | Description | Price | Total |
|          |      |       |        |             |       |       |
|          |      |       |        | 8.          |       |       |
|          |      |       |        |             |       |       |
|          |      |       | 1      |             |       |       |

\*California residents add 61/2 % sales tax. \*\*Add 3% Shipping & Handling — Add 3% surcharge for Credit cards. Order cannot be shipped unless accompanied by payment, including shipping, handling and tax where applicable.

TOTAL ORDER \$ \_\_\_\_
TAX IF APPLICABLE\* SHIPPING & HANDI ING .. TOTAL ENCLOSED S

VISA

Exp. Date Signature MAXELL • DYSAN • EPSON • CCS • SHARP • CASIO • HP • VERBATIM • MEMOREX • SOROC • CORVUS • PERSONAL SOFTWARE • CCS

CREDIT CARD#

AMPEX

NEC

CENTRONIC

**APPLE** SOFTWARE

Visidex Visiplot Visiterm

Visitrend

Visifile Desktop Plan II Desktop Plan III

Visipacl

Visicalc Apple Dos 3.3

```
Listing 2 continued:
*6630 IF ABS(Y) (=EPSILON
 **Check if done
 THEN FLAGROOT=3
 :YLAST=Y
 · YI AST=Y
 : RETURN
*664@ NUM=NUM+1
 **Check which interval the root
 lies in, update X and ask for
 :IF Y*YLAST (=@
 THEN YOTHER=Y
 a riew Y
 :XOTHER=X
 :X=(X+XLAST)/2
 :FLAGROOT=1
 :NEXTSTEP=3
 · RETURN
*665@ YLAST=Y
 :XLAST=X
 :X=(X+XOTHER)/2
 ·FLAGROOT=1
 :NEXTSTEP=3
 :RETURN
*6800 IF NEXTSTEP=0
 **Regula Falsi Method
 THEN X=X1
 **Ask for first Y
 :FLAGROOT=1
 :NEXTSTEP=1
 : RETURN
 **Store V and ask for second V
*6810 IF NEXTSTEP=1
 THEN YOTHER=Y
 :XOTHER=X
 :X=X2
 :FLAGROOT=1
 :NEXTSTEP=2
 : RETURN
*6820 IF NEXTSTEP=2
 **Determine if the Y values
 THEN YLAST=Y
 bracket the rocit
 :XLAST=X
 YLAST*YOTHER) @
 No, error
 THEN NERR=1538
 :GOSUB 1200
 :FLAGROOT=-1
 :RETURN
 :ELSE X=(XLAST+XOTHER)/2
 Yes. ask for next Y
 :FLAGROOT=1
 :NEXTSTEP=3
 : RETURN
*6830 IF ABS(Y) (=EPSILON
 **Check if done
 THEN FLAGROOT=3
 :YLAST=Y
 · YI AST=Y
 : RETURN
*6840 IF NUM=NUM+1
 **Check which interval the
 :IF Y*YLAST <=0
 root lies in, update X and
 THEN YOTHER=Y
 ask for a new Y
 :XOTHER=X
 :X=XLAST+((@-YLAST)/(YOTHER-YLAST))*(XOTHER-XLAST)
 :FLAGROOT=1
 :NEXTSTEP=3
 : RETURN
*685@ YLAST=Y
 :XLAST=X
 :X=XLAST+((@-YLAST)/(YOTHER-YLAST))*(XOTHER-XLAST)
 :FLAGROOT=1
 :NEXTSTEP=3
 - RETURN

Subroutine for saving variables when leaving
*7000 OPEN "O", #6, ADISK+"SAVEROOT"
:WRITE#6, AEQ
 :WRITE#6. AEQD
 :WRITE#6, EPSILON, FCD, FDX, FSP, FVA, METHOD%, NUMEVAL, X1, X2, NEXTSTEP, XLAST, YLAST, XOTHER, YOTHER, FPATH, FEXT, FRUN
 :CLOSE#6
*7010 OPEN "O", #6, ADISK+"ANSWER"
:WRITE#6, FLAGROOT, X, Y
 :CLOSE#6
*7020 GOSUB 1400
 : RETURN
Subroutine for restoring variables when returning
*7100 OPEN "I", #6, ADISK+"SAVEROOT"
 : INPUT#6, AEQ
 : INPUT#6, AEQD
 :INPUT#6, EPSILON, FCD, FDX, FSP, FVA, METHOD%, NUMEVAL, X1, X2
 , NEXTSTEP, XLAST, YLAST, XOTHER, YOTHER, FPATH, FEXT, FRUN :CLOSE#6
7110 OPEN "O", #7, "EQUATION. BAS":PRINT#7, AEQ
 :PRINT#7, AEQD
 :CLOSE#7
 :CHAIN MERGE "EQUATION", 7120, ALL, DELETE 9000-9001
*7120 GOSUB 1450
 : IF FRUN () @
```

# What makes a streetwise kid from New York want to help rice farmers in the tropics?

Meet Mike Harvey. He's not out to change the world, just to understand it a little better. And because he thinks that underneath all the differences people are basically alike, he feels he can help.

It's what today's Peace Corps is all about. Americans from every kind of background, of all ages, making a commitment to live and work with people around the world to meet basic human needs.



You won't be asked to move mountains but you'll understand what volunteers like Mike Harvey mean when they talk of small miracles. Why they want to work hard at a challenge unique to the Peace Corps.

Above all, you'll be learning something about the world, making friends with people you can help. And that's what life should be all about.

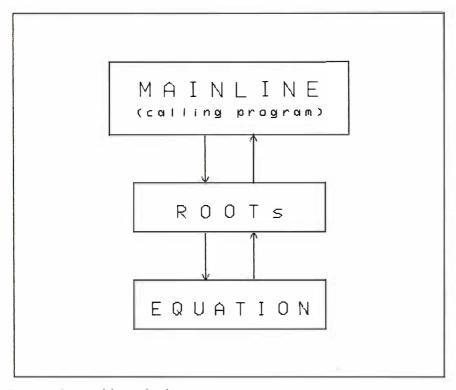
For further information, call toll free 800-424-8580. Or write Peace Corps, Washington, D.C. 20525.

# Peace Corps The toughest job you'll ever love.



Listing 2 continued on page 332

A Public Service of This Magazine & The Advertising Council



**Figure 1:** A typical hierarchical program structure.

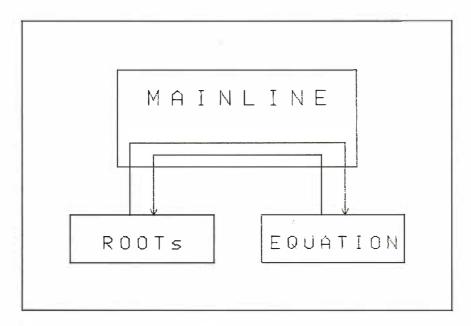


Figure 2: Interchange between modules in a program with extended control structure.

Text continued from page 320:

further and used the capabilities of Microsoft BASIC, allowing a program to modify a portion of itself (see lines 4600-4630 in listing 4 in part 2).

Both methods just presented have a hierarchical structure, as presented in figure 1. The calling program (usually the mainline program) calls ROOTs, and does not want to hear from it until the subroutine has done its job. ROOTs calls EOUATION whenever it needs a new value. This structure is straightforward and is almost the only structure taught in most programming courses.

We have seen the need, however, for a better structure to eliminate the problems cited above. This structure is presented in figure 2. In this procedure, EQUATION is a module at the same level as ROOTs, and information is passed between the two modules through the mainline program. This can be seen as a subroutine driving (or controlling) the mainline program, instead of vice versa. Such a structure gives us the capability of using ROOTs in such large programming situations as determining the rate of return on a proposed chemical plant. But a price must be paid for this flexibility through increased programming in the ROOTs module. The price is acceptable, however, if the module will be reused often in other programs.

Listings 2, 3, 4, and 5 show the revisions in the ROOTs module, reflecting the changes required to implement this increased flexibility. First, let us consider what information crosses the boundary of ROOTs. In the first version of ROOTs, given in part 2, no information was exchanged between the mainline program and ROOTs. We now need to pass three pieces of information—a value for X, a value for Y or YPRIME, and a flag (FLAGROOT) indicating what action is required by the mainline program. Remember, as ROOTs operates, it will need new values of Y and YPRIME for the new Xs. Instead of calling subroutines 9000 and 9001, we can now ask the mainline program to furnish these values. (We still have the same capability of entering an equation as before—the current presentation con-

3933 END

# HE PRICE SLAS

IF YOU WANT IT - WE'VE GOT IT ...... IF WE HAVEN'T GOT IT - WE'LL FIND IT

| ACE                                                                                                                                         | CALL                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Color or Black & White     Apple II compatible                                                                                              | 12 key numeric pad<br>Alpha lock key |
| 64K of RAM                                                                                                                                  | Visicaic keys                        |
| Upper and lower case     Typewriter style keyboard                                                                                          | 50 watt power supply<br>Built in fan |
| TEXAS INSTRUMENTS                                                                                                                           | ALL PRODUCTS CALL                    |
| ALTOS<br>8000-2                                                                                                                             | CALL                                 |
| ATARI                                                                                                                                       | CALL                                 |
| 800 w/48K                                                                                                                                   | \$675.                               |
| VIC · 20 DISK DRIVES                                                                                                                        |                                      |
| HARD DISKS AVAILABLE                                                                                                                        | CALL                                 |
| RANA SYSTEMS  Elite I w/Controller                                                                                                          | \$416.                               |
| Elite II                                                                                                                                    |                                      |
| Control Card                                                                                                                                | 99.                                  |
| A35 w/Controller · · · · · · · · · · · · · · · · · · ·                                                                                      | 429.                                 |
| A70 w/Controller                                                                                                                            |                                      |
| OKIDATA                                                                                                                                     |                                      |
| Microline 80                                                                                                                                | \$ 369.<br>469.                      |
| Microline 82A                                                                                                                               |                                      |
| Microline 84<br>Microline 2410P                                                                                                             |                                      |
| HR-1 Daisy Wheel - Parallel                                                                                                                 | 889                                  |
| HR-1 Daisy Wheel - Serial                                                                                                                   | 969.                                 |
| Forms Tractor                                                                                                                               |                                      |
| GEMINI 10                                                                                                                                   | 429.<br>CALL                         |
| C.ITOH                                                                                                                                      |                                      |
| Starwriter F10-40PU                                                                                                                         |                                      |
| NEC                                                                                                                                         |                                      |
| 8023 w/Tractors<br>3510                                                                                                                     | 489.                                 |
| 3515                                                                                                                                        |                                      |
| 7715                                                                                                                                        |                                      |
| 7725                                                                                                                                        |                                      |
| 9/45 LTD                                                                                                                                    | 2099.                                |
| 9/45 FULL                                                                                                                                   | 2199.                                |
| Micro Prism                                                                                                                                 |                                      |
| DIABLO                                                                                                                                      | CALL                                 |
| 630. RS-232. Daisy Wheel<br>630 API-Apple, IBM TRS 80                                                                                       |                                      |
| 620. MANNESMANN TALLY PRINTE                                                                                                                |                                      |
| MT 160 L                                                                                                                                    |                                      |
| MONITORS & TERMINALS-                                                                                                                       |                                      |
| USI                                                                                                                                         |                                      |
| 9" Hi Res Green                                                                                                                             | s 139                                |
| SANYO                                                                                                                                       |                                      |
| 12" Black & White<br>12" Green Screen<br>13" Color                                                                                          | 265                                  |
| 13" Color RGB                                                                                                                               |                                      |
| Viewpoint Green Screen                                                                                                                      | 589.                                 |
| Viewpoint 60                                                                                                                                |                                      |
| Esprit                                                                                                                                      |                                      |
| BMC USA                                                                                                                                     |                                      |
| 12" Green                                                                                                                                   | 145.                                 |
| 14" Color Composite                                                                                                                         |                                      |
| AMDEK<br>12" Green                                                                                                                          |                                      |
| 12" Green                                                                                                                                   | 379                                  |
| Color III RGB Color                                                                                                                         |                                      |
| 910,                                                                                                                                        | 639.                                 |
| 912<br>925                                                                                                                                  |                                      |
| 950,                                                                                                                                        | 989.                                 |
| JB 1260 12' Econo Green Hi Ru<br>JB 1201 12" Green Screen Hi Fu<br>JC 1201 12" Color<br>JC 1203 12" Hi Res Color<br>JC 203 12" Hi Res Color | es                                   |
| JC 1201 12" Color                                                                                                                           | 362.<br>799.                         |
| Cable for IBM PC · · · · · · · · · · · · · · · · · ·                                                                                        |                                      |

| SORRENTO VALLET ASSOCIATES App-L-cache 256K Memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ı |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| SSM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ı |
| AS10 Apple Serial 1/0 Card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ı |
| A10- II164.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ı |
| TG PRODUCTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ı |
| Game Paddles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ı |
| ORANGE MICRO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ı |
| GRAPPLERPLUS139.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ı |
| MICROTEK Apple Dumpling129.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ı |
| KRAFT SYSTEMS JOYSTICK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ı |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ı |
| MPC PERIPHERALS   Bubble Memory   NEW   679   16K Memory Board for Apple    *SPECIAL*   63   32K Memory Board for Apple      149                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ı |
| 32K Memory Board for Apple II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | L |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ı |
| Upper and Lower Case ROM. 19. PROM-IT. Eprom for the Apple II 99.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ı |
| Serial Input/Output Card for Apple II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ı |
| 16/32K Expansion Memory Board                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ı |
| SUP R TERMINAL 80 Column Video Board 316.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ı |
| PRACTICAL PERIPHERALS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ı |
| Microbuffer II 16K for Apple II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ı |
| 8K Serial Buffer for Epson Printer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ı |
| 16K Parallel Interface for Epson Printer.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| Z-80 Softcard for Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |
| MOUNT AIN COMPUTER CPS Multifunction for Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ı |
| The Clock for Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ı |
| Romplus 119.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ı |
| Ramplus 16K for Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ı |
| Ramplus 32K for Apple         152.           Music System for Apple         319.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ı |
| Rom Writer for Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ı |
| Z CARD for Apple II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ı |
| R.H. ELECTRONICS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ı |
| ZENER RAY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ı |
| VERSA COMPUTING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ı |
| Versawriter Graphics Tablet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | L |
| 64K. RAM + for the IBM PC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | L |
| 64K RAM + for the IBM PC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ı |
| 256K RAM + for the IBM PC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |
| Asynchronous Serial Interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ı |
| VIDEX, INC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ١ |
| VIDEX, INC. Videoterm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
| VIDEX, INC.         279.           Videoterm         29.           Softvideo Switch         29.           Inverse Chip         24.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |
| VIDEX, INC.         279.           Videoterm         29.           Softvideo Switch         29.           Inverse Chip         24.           Enhancer II         119.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
| VIDEX, INC.  Videolerm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |
| VIDEX, INC.  Videoterm 279.  Softvideo Switch 29.  Inverse Chip 24.  Enhancer II 119.  SOFTWARE FOR CP/M  ASHTON-TATE \$499.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |
| VIDEX, INC. Videoterm 279. Softvideo Switch 29. Inverse Chip 24. Enhancer II 119.  SOFTWARE FOR CP/M  ASHTON-TATE dBase II \$499. MICROPRO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| VIDEX, INC. Videoterm 279. Softvideo Switch 29. Inverse Chip 24. Enhancer II 119.  SOFTWARE FOR CP/M  ASHTON-TATE dBase II \$499. MICROPRO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| VIDEX, INC. Videoterm 279. Softvideo Switch 29. Inverse Chip 24. Enhancer II 119.  SOFTWARE FOR CP/M  ASHTON-TATE dBase II \$499. MICROPRO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| VIDEX, INC.         279.           Videoterm         279.           Softvideo Switch         29.           Inverse Chip         24.           Enhancer II         119.           SOFTWARE FOR CP /M         44.           ASHTON-TATE         499.           MICROPRO         490.           Wordstar         18 FOSTAR CALL         CALL           Calscistr         CALL           Daisstar         REPORTS AR         CALL           Supersort         CALL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |
| VIDEX, INC.  Videoterm 279  Softvideo Switch 29,  Inverse Chip 24,  Enhancer II 119  SOFTWARE FOR CP/M  ASHTON-TATE  dBase II \$499,  MICROPRO  Wordstar September 1, FEOSTAR CALL  Calcistar CALL  Calcistar CALL  Daisstar REFORTS TAR CALL  Supersort CALL  Spellstar CALL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |
| VIDEX. INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |
| VIDEX. INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |
| VIDEX. INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |
| VIDEX   INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   25   Enhancer II   26   Enhancer II   26   Enhancer II   27      |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   25   Enhancer II   26   Enhancer II   27       |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   25   Enhancer II   26   Enhancer II   27   Enhancer II      |   |
| VIDEX, INC.  Videoterm 279, Softvideo Switch 29, Inverse Chip 24, Enhancer II 119,  SOFTWARE FOR CP/M  ASHTON-TATE  dBase II \$499, MICROPRO Wordstar INFOSTAR CALL CALL Calstar CALL Datastar REPORTS CALL Supersort CALL Supersort CALL Marce 80 189, MICROSOFT  Fortran 80 369, Marce 80 189, Basic Compiler 319, mu/MATH/mu/SIMP B0 279, Cobol 80 595, Basic 80 299, Edit B0 96, X Marce 80 162, mu/LISPC mu/SIAR B0 162, mu/LISPC |   |
| VIDEX   INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   119   24   Enhancer II   119   25   Enhancer II   119   25   Enhancer II   119   26   Enhancer II   27   Enhancer II   28   Enhancer II   29   Enhancer II   20      |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   24   Enhancer II   26   Inverse Chip   27   28   29   Enhancer II    |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   24   Enhancer II   24   Enhancer II   24   Enhancer II   25   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   27   Enhance    |   |
| VIDEX   INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   SOFTWARE FOR CP / M   ASHTONI-TATE   Glass II   5499   MICROPRO   CALL   CALL   Mailmerge   INFOSTAR CALL   CALL   Calcistar   CALL   Calcistar   CALL   Calcistar   CALL   Calcistar   CALL   Calcistar   CALL   Calcistar   CALL   Supersor   CALL   Supersor   CALL   Spellstar   CALL   Spe    |   |
| VIDEX, INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   25   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   27   Enhance    |   |
| VIDEX, INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   25   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   27   Enhance    |   |
| VIDEX. INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   24   Enhancer II   119   SOFTWARE FOR CP / M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   24   Enhancer II   24   Enhancer II   24   Enhancer II   25   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   26   Enhancer II   27   Enhancer II   28   Enhance    |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   24   Inverse Chip   26   Inverse Chip   26   Inverse Chip   26   Inverse Chip   26   Inverse Chip   27   Inv    |   |
| VIDEX, INC.   Videoterm   279   Softwideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   24   Enhancer II   24   Enhancer II   24   Enhancer II   25   Enhancer II   26   Enhancer II   27   Enhance    |   |
| VIDEX, INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   26   Inverse Chip   27   Inverse Chip   27   Inverse Chip   28   Inverse Chip   28   Inverse Chip   28   Inverse Chip   28   Inverse Chip   29   Inverse Chip   20   Inv    |   |
| VIDEX, INC.         Videoterm         279           Softvideo Switch         29.           Inverse Chip         24.           Enhancer II         119           SOFTWARE FOR CP/M         119           ASHTON-TATE         3499.           MICROPRO         CALL           Wordstar         CALL           Calstar         CALL           Calstar         CALL           Calstar         CALL           Supersor         CALL           Supersor         CALL           MICROSOFT         COLL           Fortran 80         369           Macro 80         189           Basic Compiler         319           mw/MATH/mu/SIMP B0         219           Cobd 80         299           Edit B0         96           X Macro 80         162           mu/LISP/mu/STAR 80         162           mu/LISP/mu/STAR 80         162           mu/LISP/mu/STAR 80         162           Multi Plan         Also Available For Apple         205           SELECT INFORMATION SYSTEMS         205           SELECT INFORMATION SYSTEMS         408           SOFTWARE DIMENSIONS. INC.         Accou                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| VIDEX, INC.   Videoterm   279   Softvideo Switch   29   Inverse Chip   24   Enhancer II   119   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   25   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   24   Enhancer II   119   26   Inverse Chip   26   Inverse Chip   27   Inverse Chip   27   Inverse Chip   28   Inverse Chip   28   Inverse Chip   28   Inverse Chip   28   Inverse Chip   29   Inverse Chip   20   Inv    |   |

| SOFTWARE FOR IBM                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------|
| SORCIM                                                                                                                                    |
| Supercalc         \$205           SuperWriter         295                                                                                 |
| Spellguard                                                                                                                                |
| SELECT INFORMATION SYSTEMS                                                                                                                |
| Select Word Processor W/Superspell                                                                                                        |
| Visicalc 256K Version         189           Visitrend         239                                                                         |
| Visitrend                                                                                                                                 |
| Visidex                                                                                                                                   |
| Desktop Plan I                                                                                                                            |
| MICROPRO                                                                                                                                  |
| MailmergeLOWES CESCALL                                                                                                                    |
| Wordstar CALL Mailmerge LOWES CALL Spellstar CALL                                                                                         |
| INNOVATIVE SOFTWARE TIM III Data Base Management System                                                                                   |
| I.U.S.                                                                                                                                    |
| Easyspeller                                                                                                                               |
| Easyfiler         289           Easywriter II         269                                                                                 |
| SOFTWARE DIMENSIONS, INC.                                                                                                                 |
| Accounting Plus CALL CONTINENTAL SOFTWARE                                                                                                 |
| The Home Accountant Plus                                                                                                                  |
| DENVER SOFTWARE EASy (Executive Accounting System)                                                                                        |
|                                                                                                                                           |
| Condor II CONDOR 449                                                                                                                      |
| Crosstalk MICROSTUF                                                                                                                       |
| Crosstalk         MICROSTUF         169           MathMagic         ISM         75           The Tax Manager         MICROLAB         175 |
| d Base II ASHTON—TATE                                                                                                                     |
| SOFTWARE FOR APPLE                                                                                                                        |
| BRODERSUND                                                                                                                                |
| Serpentine                                                                                                                                |
| MICROSOFT                                                                                                                                 |
| Typing Tutor II                                                                                                                           |
| Adventure25                                                                                                                               |
| Fortran 80 165 A.L.D.S. 100 *Basic Compiler 315                                                                                           |
| *Basic Compiler                                                                                                                           |
| mu/MATH/mu/SIMP 80                                                                                                                        |
| *Cohol 8 0 595                                                                                                                            |
| M/Sort                                                                                                                                    |
| Softcard Premium System                                                                                                                   |
| Time Manager                                                                                                                              |
| SELECT INFORMATION SYSTEMS                                                                                                                |
| Select Word Processor                                                                                                                     |
| CCA Data Management System                                                                                                                |
| Visitorm 76                                                                                                                               |
| Visitetin                                                                                                                                 |
| Visiteed (Visited                                                                                                                         |
| Visitile                                                                                                                                  |
|                                                                                                                                           |
| Visipack         549           Desktop Plan II         189                                                                                |
|                                                                                                                                           |
| *Calcstar                                                                                                                                 |
| *Supersort REPORT STATE CAL                                                                                                               |
| **Calcistar                                                                                                                               |
| *Mailmerge PAICES CAL *Spellstar CAL                                                                                                      |
| SORCIM                                                                                                                                    |
| Spellguard                                                                                                                                |
| Data Capture 4.0                                                                                                                          |
| EDU-WARE                                                                                                                                  |
| DatafaxLINK SYSTEMS 139                                                                                                                   |
| dBase II                                                                                                                                  |
| SupercalcSORCIM                                                                                                                           |
| MODEMS -                                                                                                                                  |
| HAYES MICROCOMPUTER PRODUCTS                                                                                                              |
| Smartmodem                                                                                                                                |
| Smartmodem 1200                                                                                                                           |
| Micromodem 100                                                                                                                            |
| Chronograph 225                                                                                                                           |
| NOVATION                                                                                                                                  |
| Cat                                                                                                                                       |
| Auto Cat                                                                                                                                  |
| Apple Cat II                                                                                                                              |
| NEW                                                                                                                                       |
| C O D     CASHIERS or CERTIFIED CHECK                                                                                                     |
|                                                                                                                                           |



WE ACCEPT • MONEY ORDER • C.U.D. • CASHIERS or CERTIFIED 0
• PERSONAL CHECK (allow 10 days to clear) • BANK WIRE TRANSFERS
• VISA MASTERCARD (add 2°-6)
Add 3°-6 for shipping, handling & insurance (\$5 min.) Calif
residents add 6°-6 tax. All equipment is new, comes with
manufacturers guarantees. PLUS we guarantee it for 30 days
and pairy shipping charges on any returns All equipment subject
to price change & availability without notice. Check quantity discounts

8380 Miramar Road, Suite 200 San Diego, CA 92126

**ORDERS ONLY: 800-752-1341** CALIFORNIA ORDERS: 619-578-1033

INFORMATION: 619-578-1033

# Listing 3: HELP messages for ROOTs.

```
The ROOTs module is used to find the real roots of any equation.
The following words are always skipped over at any place in the line:
 AN
 THE
 FOR
 DND
 EQUALS
 EQUAL
 IS
 ORF
 OF
Commas(,) and equivalence signs(=) are also skipped.
The ontions of ROOTs are:
 USINg method
 where the methods are:
 (Newton's method)
 APPRoximate NEWTon
 (Approximate Newton's method)
 SECANI
 (Secant Method)
 INTErval HALving
 (Interval Halving Method)
 REGUla FALSi
 (Regula Falsi Method)
 STARTing (points) ##.# (##.#)
 sets the starting points for the methods.
 Newton's method requires 1 point.
 Approximate Newton's method requires 2 points close together (4.99 & 5)
 Secant Method requires 2 points.
 Interval Halving and Regula Falsi require 2 points that bracket the
 root between them.
 MAXImum (EVALuations) ##
 ## is the maximum number of evaluations before reporting failure to
 meet convergence requirements.
 FPSIlon ##.#
 When ABS(Y)(##.#, the root is considered to be found.
 VALUe (at) ##.#,##.#....
 will give the value of the current equation at the values of X entered
 FRUAtion
 'Y=function of X'
 EXTErrial
 If an equation is furnished, it must be in correct BASIC syntax.
 EXTErnal means that ROOTs will get the values it requires from the
 calling program.
 DYDX 'YPRIME=function of X'
 used to enter the derivative of X needed by Newton's Method.
 enter using correct BASIC syntax.
 If EXTErnal is the option under
 EQUAtion, entering a derivative will cause an error.
 CLEAr
 used to set values of variables to their default values
 equivalent to the following commands
 USINg SECAnt
STARting 0 1
 MAXImum EVALuations 20
 EPSIlon 0.1
 EQUAtion 'Y=X'
 DYDX 'YPRIME=1'
 EXECute
 causes the root to be found.
```

## **Listing 4:** Variables used in the ROOTs module.

ACOPY Temporary variable for copying files

AEQ Internal equation containing the root Default is "Y=X" to be found

Listing 4 continued on page 339

cerns the situation where the calculations are too long for one line.) At this point, the subroutine is making all the decisions, and the mainline program's job is only as a "slave," doing exactly what ROOTs tells it to do.

The commands (values of FLAGROOT) returned to the mainline program are:

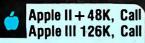
- O Program not activated. ROOTs is not actually executing in order to find the root of an equation "external" to itself. Continue with normal mainline program processing.
- 1 Furnish a value of Y to the sub-routine for the given X.
- 2 Furnish a value of YPRIME to the subroutine for the given X.
- 3 Execution completed normally. The value of X is within specified limits. Continue with normal mainline processing.
- -1 Execution terminated abnormally, the result of an error. Handle the error (given in NERR) as desired.

As with most other parameter passing in the POL/PS, these parameters will be in a file (ANSWER). Note that only 3 values cross this boundary instead of a more normal 10 to 15. This is the advantage of extended control structure; because all the other values are needed only within ROOTs, they stay there.

Several changes are made in ROOTs to implement extended control structure. (The changed lines have an asterisk in front of them; see listing 2.) The basic changes are as follows:

- An option has been added, allowing specification of an external "equation" (see listing 2, lines 4600-4650).
- •All requests for Y or YPRIME values (when executing to find a root) are now directed to a *single* point in ROOTs (line 5120). This required some significant rewriting, especially of lines 6000-7000.
- Additional internal flags (NEXT-STEP and FEXT) have been added to control the internal flow of the program.

Text continued on page 340



Apple II Compatible Hardware & Software

# MICROSOFT

MicroSoft Softcard Premium System (Includes: Softcard, RAM Card, VidexVideoterm 60 Col., Softswitch, Osborne CP/M® user gulde) . . . . . . Only \$519 16K RAM Card by Microsoft . . . 145 Z-80 Soft Card by Microsoft . . . . 275

# Videx

Videx VideoTerm 80 Col. Card... \$245 Videx Keyboard Enhancer i (Orig.) . . . 75 Videx Keyboard Enhancer II...... 129

# VISTA COMPUTER COMPANY INC.

Vision 80 Videe Display Card. . . . \$255 Apple III Clock/Calender Card . . . . 159 Obi. Dens. 8"Disc Controller. . . . 299 Dual 8"Disc Drives . . . . . . . Call

# Mountain Computer

Expansion Chasis (8 Slots)........... 569 ck/Calandar Card . . . . . . . . . . . . . 229 A/0+0/A interface.....279 board Filter ROM for Romplus..... 40 Copy ROM for Romplus..... Rom Writer card Rom Plus 32K RAM add-on (w/16K) . . 149

# VISICORP PARTY NAME

VisiFile (Data Base Management)... 185 VisiTrend/VisiPlot......199 VisiSchedule (New) . . . . . . . . . 239 Desktop Plan II . . . . . . . . . . . . 185

# Computers for people."

Call for newest low price!

ATARI 800, Now w/48K!

| ATARI 410 Program Recorder  | \$79 |
|-----------------------------|------|
| ATARI 810 Disk Drive        | 419  |
| ATARI 850 Interface         | 159  |
| ATARI 830 Modem             |      |
| ATARI 825 80 Column Printer |      |
| ATARI Joysticks, (Pair),    |      |
|                             |      |

| ATARI Pac Man \$29.95       |
|-----------------------------|
| ATARI Star Raiders 29.95    |
| ATARI Missile Command 29.95 |
| ATARI Asteroids29.95        |
| ATARI Centipede 29.95       |
| ATARI Caverns of Mars 29.95 |

## -WICO-

**Arcade Quality** JOYSTICK CONTROLLERS by WICO . . . . . \$24.95 ea.

# -PERCOM-

ATARI SSDD Single Disk Drive...\$639 ATARI SS DD Dual Disk Drive . . . 989

ALIEN VOICE BOX Voice Synthesizer (for ATARI& Apple), \$99

# HP-41C .... \$149 HP-41CV ..... \$219

HP-41 Card Reader.....\$159 HP-41 Optical Wand . . . . . . . . . 99 HP-41 Printer (82143A) . . . . . . . 289 HP-IL Interface Module.......99 HP-IL Printer (82162A)......379 HP-IL Digital Cassette Orive . . . . 419 HP-IL Video Interface Mod. . . . . 229 HP-41 Quad Memory Mod . . . . HP-41 Ext. Func. Mem. Mod. . \$59 HP-41 Ext. Memory Mod. ... HP-41 Time Module.....



HP-11C, \$79 HP-10C, \$59

QUADBOARD by QUADRAM, Inc. Memory Expansion, Clock, Parallel Interface, R232 Int., ON ONE BOARD! Quadboard w/64KInstalled.... \$495 Quadboard w/192K Installed . . . . 719 Quadboard w/256K Installed . . . . . 728

-IBM SOFTWARE-WordStar by MicroPro..... \$299



## Franklin Ace 1000 Color Pkg.

- Ace 1000 w/color
- Disk Drive w/color
   RF Modulator (for color TV), \$1499
- Franklin Add-on Drive...... Call -MICROSCI-

Apple II + Compatible Drive
Disk Drive w/Controller.....\$479 Disk Drive w.o./Controller . . . . 379

## -RANA/Apple-Elite | Disc Drive . . . . . . . . . \$349

Elite | Disc Drive w/Controller . . . . 449 Elite II Disc Drive......549 Elite Controller Card......99

## **CORVUS SYSTEMS**

Corvus Winchester 5 Meg. Disk, \$2295 Corvus Winchester 10 Meg. Disk, 2895 Corvus Winchester 20 Meg. Disk, 3795 Mirror Back-Up . . . . . . . . Call

Advertised prices do not include shipping. Prices are subject to change and offers may be withdrawn without notice.



**TEXAS INSTRUMENTS** COMPUTERS

# TI-99/4, \$198\* \*Net cost after \$100 Factory Rebate.

Peripheral Expansion System .. \$195 RS-232 Interface Card. . . . . . . 139 Disk Controller Card . . . . . . . . 195 Disk Drive . . . . . . . . . . . . . 299

## TEXAS INSTRUMENTS SOFTWARE

PHM-3026 Extended Basic.... \$74.95 PHM-3035 Terminal Emulator II . . 39.00 PHM-3055 Editor/Assembler . . . . 74.95 PHM-3058 Mini Memory......74.95 PHM-3013 Prsni.Rec.Keeping . . . 39.00 PHM-3053 TI Invaders...... 32.00 

# TEXAS INSTRUMENTS

| CALCULATURS                  |       |
|------------------------------|-------|
| TI-88 Calculator             | \$260 |
| TI PC-800 Printer/Plotter    | . 150 |
| TI CA-800 Cassette Interlace | 50    |
| TI-59 Calculator             | . 169 |
| TI-58C Calculator            | 79    |
| TI PC-100C Printer/Plotter   | . 149 |
| TI-55II Calcufator           | 40    |
| TI LCD Programmer            | 55    |
|                              |       |

# -MONITORS-

**ZIMDEK** Color | . . . . . . . \$339 Color II . . . . . . . 699 Color III . . . . . . . . 429

BMC 12"Gr.,...\$99 Sanyo 9''Gr., . . . 159 Sanyo 12''Gr., . . 209

(FIJITH ZYM-121 Green Phos

-PRINTERS

MX-80....

NEC 802Impact Dot Matrix . . . . . . . . \$489 3510 33 CPS Serial . . . . . . . . 1749 3530 33 CPS Centronics Par., . . . . 1749 BI-Directional Tractor (3500) . . . . 229 

Tractor for 7700 Series . . . . . . . . 229

-CENTRONICS-Centronics 730-1 Parallel . . . . . \$299 Centronics 737-3 Serial . . . . . . . 299

Smith-Corona Daisy Wheel TP-1.. Now \$629

-MODEMS-

Novation Novation Cat.. \$139 Novation D-Cat . . . . . . . . . . . 149 Novation 212 ..... 595 Novation Apple Cat II . . . . . . . . . 310

Micromodem II Hayes Micromodem II ..... \$279 Smartmodem 300 . . . . . 219 Smartmodem 1200 . . . . . . . . 549

Chronograph . . . . . . . . . . . . . . . 199

Circle 333 on inquiry card.

ersonal omputer vstems P.O. Box 1073

315-478-680

# **Ecommodore**



Commodore VIC-20 . . . . . . \$189.95 Commodore Datasette . . . . . 67.00 Commodore Super Expander . . . 59.00 Commodore 8K Memory.....52.00 Commodore VIC Avenger.... 24.95 Commodore VIC Super Allen. . . . 24.95 Commodore VIC Jupiter Lander . 24.95

# -CABLES-

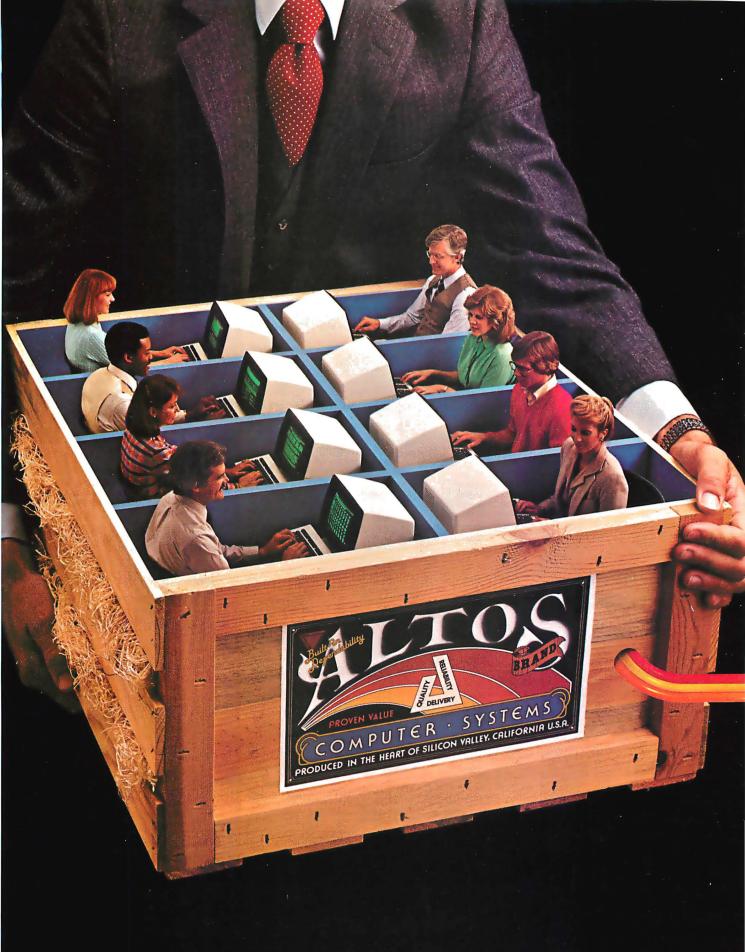
**Parallel Printer Cables** ATARI.....\$35 IBM . . . . . . . . . . . . . . . 40 

If you are in need of something you cannot find in our ad. PLEASE CALL.

# SHARP

PC-1500 Hand Held Computer. . . . \$219 CE-150 Printer/Cass. Interlace . . . . 195 CE-152 Cassette Tape Recorder....75 CE-155 8K RAM Memory Module.... 99 CE-151 4K RAM Memory Module . . . . 50





# 1 TO 16 USERS TO GO

# Altos multi-user 8086 or 68000-based networking computers are chosen by more OEMs and Fortune 1000 companies. Here's why...

ALTOS® 16-bit computer systems do more for more users. They give you more power. More features. And more reliability. For less money.

You get a choice of 8086 or 68000-based family processors, memory management to one MB of RAM, an intelligent Z80" I/O and disk controller, plus up to 160 megabytes of fast Winchester storage.

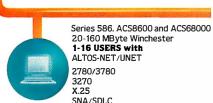
A single Altos computer can serve up to 16 users. And every Altos 16-bit computer gives you

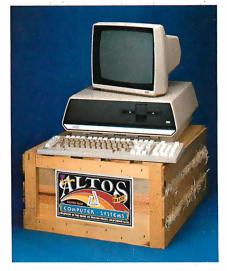
# INTER-ALTOS LOCAL NETWORK



Series 586, ACS8600 and ACS68000 20-160 MByte Winchester 1-16 USERS with ALTOS-NET/UNET"

# REMOTE COMMUNICATIONS





added features like Multibus™ interfacing, real time clock, power fail detection and comprehensive diagnostics.

But that's just the beginning. Link multiple Altos' together and communicate in the office of the future today. Serve hundreds of users with full Ethernet' and ALTOS-NET' hardware and software support. And save money with fewer interconnects.

In addition, Altos supports remote communications protocols such as 2780/3780, 3270, X.25, and SNA/SDLC.

Altos has all the 16-bit software you need, too. With popular operating systems like XENIX'\*/UNIX'\* (with a user-friendly 'business command menu interface''), CP/M-86,'\* MP/M-86,'\* OASIS-16, MS'\*-DOS and PICK for 8086-based systems; plus UNIX System III'\* and RM/COS'\* for 68000-based systems.

Altos also has high-level languages (BASIC, FORTRAN, COBOL and PASCAL), and applications software (ABS/86 and ABS/68 for general accounting, word processing and financial planning).

Since 1977, Altos has delivered more than 30,000 highly reliable, fully socketed, proven single board microcomputers and peripherals built for business.

If you've been looking to go with a more powerful computer that can serve from 1 to 16 users for less money, call or write us today.

Altos Computer Systems 2360 Bering Drive San Jose, CA 95131 (408) 946-6700 Telex 171562 ALTOS SNJ or 470642 ALTO UI

# Packed with fresh ideas for business



**800-538-7872** (In Calif. 800-662-6265)

Circle 19 on inquiry card.



## Listing 4 continued:

NEXTSTEP

NUMEVAL

Default is "YPRIME=1" Contains the derivative of AFR ΔEΩD **EPSILON** The value for determining success of Default - .01 finding root--success if ABS(Y) (=EPSILON FCD Flag for checking command syntax Flag for making sure a new AEQD is entered if AEQ is changed (required for Newton's Method) FDX Q=internal FEXT Flag showing whether to use external (furnished by calling program) or 1=externa: internal values (from AEO and AEQD) Flag to the calling program FLAGROOT 0=program not executing 1=furnish Y for current X 2=furnish YPRIME for current X 3≈normal completion of rootfinding; roct is in X -1=abnormal completion; error @=normal execution FRUN Internal flag indicating status of the module 1=finding root 2=plotting equation 3=getting numerical values Default = 2 FSP Number of starting points entered FVA Flag for syntax after VALUe (AT) TRET1 Temporary storage of calling program return point Default=3 (Secarit) METHOD:4 Flag for method to be used

Independent variable in AEQ and AEQD

X 1 Starting point 1 Default = 0 Default = 1 Starting point 2

Internal flag set by computational subroutines to indicate the next step

Maximum number of attempts (to find root) before failure is declared

Default=80

Dependent variable in AEQ YPRIME Dependent variable in AEQD XOTHER A previous X value attempted

YOTHER Y value at XOTHER

XLAST Another previous X value attempted

Y value at XLAST YLAST

YNFW X value for next attempt

## **Listing 5:** Error messages for the ROOTs module.

1501, "Missing axes type after DRAW or REDRaw" 1502, "Unexpected first entity in command" 1521, "Unexpected entity after ROOTS" 1522, "Unexpected mame of method after USINg" 1523, "Missing first number after START 1524, "Both starting numbers are equal" 1525, "Expecting integer (between 2 and 10000) after MAXImum EVALuations" 1526, "Expecting real number ((10) after epsilon" 1527, "Expecting a number after VALUE" 1533, "Missing string after EQUAtion" 1534, "Missing string after DYDX" 1535, "Missing 2 starting values when method requires 2" 1536, "Did not redefine DYDX after changing EQUAtion" 1538, "Starting points do not bracket the root" 1539, "Attempted to enter DYDX when EQUAtion EXTErnal is declared" 1540, "Root not found in maximum number of attempts" 1541, "Failed to decode remainder of line" 3999, "\*\*\*\*\*Last entry in an error list must always be Line 9999\*\*\*\*\*\*



My name's McGruff, and it's my business to help prevent crime. I think it should be your business, too—to teach your employees how to protect themselves. Just send for my business kit—it'll help you develop a program that teaches your employees how to make their homes burglar-proof, make their neighborhoods safer, even how not to get mugged.

And, while you're at it, get in touch with the cops-they can help you out. So now you're probably wondering (like a top cat businessman should), what's in it for you. That's easy. When your company works harder for your people, your people work harder for your company.

So take the time, and...

# TAKE A BITE OUT OF



Write to McGruff, Crime Prevention Coalition, 20 Banta Place, Hackensack, NJ 07601 for lots of information on Crime Prevention.

A message from the Crime Prevention Coalition, this publication and The Ad Council. ©1980 The Advertising Council, Inc. Council

**Listing 6:** Sample changes in a section of the NUMRANAL mainline program. This illustrates the changes required for using the extended control structure.

```
4000 AM="ROOT"
 :NI FT=4
 :GOSUB 750
 :IF FLAG=0
 GOTO 4010
4001 IRET=4002
 :ARET=ADISK+"NUMRANAL"
 :GOSUB 1400
:CHAIN MERGE ADISK+"NUMRROOT",3000,DELETE 3000-9999
4002 GOSUR 1450
:OPEN "I", #6, ADISK+"ANSWER"
 : INPUT#6, FLAGROOT, X, Y
 :CLOSE#6
 :IF FLAGROOT=0 OR FLAGROOT=3
 GOTO 3100
4003 IF FLAGROOT()1
 THEN GOTO 4005
ELSE OPEN "O", #6, ADISK+"ANSWER"
:WRITE#6, 1, X, Y
 :CLOSE#6
 :IRET=4004
 . ORET=ODISK+"NUMRONOL"
 :GOSUB 1400
 :CHAIN MERGE ADISK+"NUMRECON", 3000, DELETE 3000-9999
4004 GOSUB 1450
:OPEN "I", #6, ADISK+"ANSWER"
 :INPUT#6, FLAGROOT, X, Y
 :CLOSE#6
 :OPEN "O", #6, ADISK+"ANSWER"
 :WRITE#6,FLAGROOT, X, Y
 :CLOSE#6
 :GOTO 4001
4005 IF FLAGROOT()2
 THEN GOTO 4007
ELSE OPEN "O", #6, ADISK+"ANSWER"
:WRITE#6, 2, X, Y
 :CLOSE#6
 :IRET=4006
 : ARET=ADISK+"NUMRANAL"
 :GOSUB 1400
 :CHAIN MERGE ADISK+"NUMRECON", 3000, DELETE 3000-9999
4006 GOSUB 1450
 :OPEN "I", #6, ADISK+"ANSWER"
:INPUT#6, FLAGROOT, X, YPRIME
 :CLOSE#6
 :OPEN "O", #6, ADISK+"ANSWER"
 :WRITE#6, FLAGROOT, X, YPRIME
 :CLOSE#6
 :GOTO 4001
4007 FFRR=1
 :GOTO 3100
```

Text continued from page 334:

The relationship between the computational subroutines (lines 6000-7000) and the computational loop (lines 5100-5210) is similar to the one between ROOTs and the mainline program, with the computational subroutines actually setting the values of FLAGROOT.

The hardest part in using extended control structure is visualizing how the control is handled. The easiest way to explain this is by analogy. Imagine a typical company—the president makes all the major policy decisions. The vice-presidents make decisions on how to implement the policies of the president and so on down the chain of command. Each person further down the line has less control over decision making. This is analogous to the typical computer program—the control is concentrated at the top.

Compare this to extended control

structure in POL/PS-type programs. It is like an engineer or administrator in a department temporarily taking control over all decisions concerning the production of product X. All the top brass are *temporarily* taking orders from her because she knows more about making product X than anyone else. The concept is similar to delegation of authority, and the benefits are equally great, especially in reducing the work load at the top.

I talked about the functions of a mainline program earlier. It typically handles input and output, links major modules or subroutines together, and handles decision making. In ROOTs, we have seen that most of the input and output can be handled in modules. I have just shown how much of the decision-making logic can also be placed in these modules. This leaves the mainline program with one principal function—linking

the modules together. This is the reason the sample mainline program given in listing 1 is so much shorter than ROOTs, which is itself a small module.

The mainline program can be easily modified to pass the information between modules. Listing 6 gives an example of how this can be done using a module called ECONomics (for calculating the rate of return). These lines can quickly be rewritten to link ROOTs with any other acceptable module.

## Where Do We Go From Here?

There is a problem with the present concept of extended control structure as implemented in POL/PS. All the links between modules must currently be written before the program is run and cannot be changed during the program's execution. It is desirable to be able to modify the module links interactively. To be able to define the links interactively would allow the use of modules in response to results different from the ones foreseen. One example is the fitting of a complex curve relating the energy of an object to temperature and pressure. Simple equations may be done by using a standard linear-regression package (curve fitting using the least-squares method) that will handle computations internally. More complex equations may require an optimizer and a contour plotter in order to find the desired values. Because there are several types of optimizer programs, each requiring a different module, we must be able to switch between different optimizers if the first does not do the job well enough. Being able to do that interactively means we do not have to exit the program, modify the linkages in the mainline program, and restart the program. Rather, we can simply change a few specifications from within the program.

This capability is currently being developed and tested in the GRIP program by Rick Hilst. His papers (see the references) show the growth of these concepts. The idea of extended control structure was conceived to aid in interactive linkage of modules. Because a mainline program

# Putting It All Together

Now you can put the files on the disks in order to use them. Be sure to store all BASIC programs in unprotected ASCII format, or the CHAINs will not work. The following files are needed:

- 1. POL-80.BAS—remove the comments from listing 3, part 1, and put the program on disk.
- 2. POLERR—the error-message file for POL-80. Put listing 6, part 1 on disk, and then run the program from listing 7, part 3, placing the results in POLERR on the disk.
- 3. NUMRANAL.BAS—remove the comments from the program in listing 1, part 3, modify as desired (add other modules), and save it in ASCII format on the disk.
- 4. NUMRROOT.BAS—remove the comments from listing 2, part 3, and save it in ASCII format on the disk.
- 5. VOCANUMR—(VOCAbulary list) save listing 8, part 3 on the disk.
- 6. NUMRVOCA, NUMRHELP, NUMRROOT, NUMR-STOP—these are the help messages. Set them up as sequential files on the disk. See listings 3, 9, 10, and 11 in part 3.

Listing 7: The MAKEERR program converts sequential files containing error lists into random files required by POL-80 programs.

```
100 INPUT "SOURCE FILE FOR ERRORS": A$
200 INPUT "DESTINATION FILE FOR ERRORS"; B$
300 OPEN "I",#1,A$
400 OPEN "R",#2,B$,80
 :FIELD#2,80 AS C$
500 INPUT #1, E%, E$
600 IF E%=9999
 THEN CLOSE #1
 :CLOSE #2
 :PRINT "DONE"
 :STOP
700 LSET C$=E$
800 PUT #2,E%
900 GOTO 500
```

Listing 8: The VOCANUMR file contains the main command words for NUMRANAL.

```
"HELP"
"VOCAbulary"
"ROOTs"
"CONTours"
"STOP"
```

# Listing 9: NUMRVOCA file.

```
VOCAbulary gives the list of command words for
this particular module This mainline module
ignores the following words:
 Α
 AN
 THE
 FOR
 LS
 ARE
 EQUAL
 EQUALS
It also ignores (considers as a space) commas and
the equivalence (=) sign.
```

- 7. NUMRERR—enter listing 6, part 1, and listing 5, part 3 on the disk, and then run listing 7, part 3 as many times as needed, placing the results in NUMRERR on the disk.
- 8. SAVEROOT—enter listing 12, part 3 on the disk as a sequential file.

The disk is now set up and ready to go. To run the program, get into BASIC and set up eight file buffers (MBASIC5 /F:8 for the Vector Graphic computer). Then load POL-80 and run the program (LOAD "POL-80",R). Bring up NUMRANAL as the current mainline program (@PRG 'B:NUMRANAL'). Now you can begin using POL commands. Try this sample: "ROOTS, USING SECANT, EQUATION = 'Y = SIN(X)', START AT .5 AND 1, EX-ECUTE".

Several steps are required to add a module to NUMRANAL. First, enter the module onto the disk as NUMR\_\_\_\_.BAS (replace the underlined portion with the module name). Be sure to use the ASCII format. Next, modify NUMRANAL.BAS to access the new module and add the keyword to VOCANUMR. Then enter the HELP message as NUMR\_\_\_\_ on the disk as a sequential file. Run MAKEERR with the error list (see listing 5, part 3 for the format of the error list). Save the output of NUMERR on the disk. Put any special module file (such as SAVEROOT for ROOTs) on disk b. Once the programs are already on a disk, the actual process takes only 5 to 10 minutes.

# Listing 10: NUMRHELP file.

```
HELP gives formats and assistance on the command
```

The acceptable format is:

HELP WORD

WORD is one of the words listed by VOCA. ALL may be used after help to get assistance on all of the command words.

The format to get a printout on the list device (typewriter, etc.) is:

HELP WORD

Do not use this command (HELPL) if you have a plotter hooked to the list devices or if you have begun drawing using a Diablo-type printer

Listing 11: SAVROOT file.

```
"1508 Y=X*X*X:RETURN"
"1507 YPRIME=3*X^2:RETURN"
. 0001, 1, 0, 0, 0, 3, 100, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0
```

Listing 12: NUMRSTOP file.

STOP is used to terminate NLP-80.

is effectively modified (although not actually in FORTRAN), most decision making must be done in the modules. If there is sufficient interest. some of the results of this research can be included in a module for POL-80 to do the interactive linking.

# Summary

Consider the advantages of the POL/PS system that have been presented:

- The mainline program can often be much shorter and easier to write and debug than other typical programs that are not POL/PS-compatible.
- A library of technical and graphics modules can easily be built up. Extended control structure gives these modules more flexibility, yet allows easier insertion into other programs.
- Packages of programs (such as numerical analysis or statistics with graphics) can be used by a person with little programming experience, yet the packages may be more powerful than similar non-POL/PS packages.
- Plotter compatibility is planned. Adapting the graphics modules to a new plotter requires only revising about four input/output routines and changing four parameters. Most plotters are supported.
- Input using POL is faster and more powerful than question-and-answer or menu input.

# Conclusion

In presenting the POL/PS series, I have tried to develop a framework for technical programs that will offer advantages not only for the programmer, but the end user as well. The concepts of a problem oriented language, modularity, and the use of mainline programs are applicable to almost any technical field. The use of POL can encourage the use of microcomputers in scientific and technical areas, much as microcomputers are used in business and word-processing applications.

I intend to support and upgrade the system and encourage others to write their own applications using the POL/PS framework presented here. The Problem Oriented Language can become the problem-solving solution for you.

## References

- 1. Hilst, R. W. Development and Use of GRIP, the Generalized Routine for Interactive Processing, in the Computer Solution of Chemical Engineering Problems. Master's thesis, University of Kansas, August 1982.
- 2. Hilst, R. W. and K. A. Bishop, "Recent Advances in the Development and Use of GRIP-A Problem Oriented Language." Summer Computer Simulation Conference, pp. 29-35, Seattle, August 1980.
- 3. Hilst, R. W. and K. A. Bishop. "The Use of GRIP, a Problem Oriented Language, in Chemical Engineering Education." Presented at the 87th National AIChE Meeting, Boston, August 1979.

The following items are available from the author:

- 1. The POL/PS User's Manual and the ROOTs User's Manual for \$20. These manuals generally supplement but do not duplicate the material presented here. Topics include detailed rules of input, theory and examples of operation, and programming rules and hints.
- 2. The two manuals above and a disk containing all the appropriate files for \$30.
- 3. The items listed above and the graphics package (which includes the contour plotter module) for \$200. The ROOTs module in this package will have additional graphics capabilities, such as plotting the equation and graphically following the root-finder as it seeks the root.

These items will be offered on several disk formats (CP/M 8-inch, Osborne, and others as I can make arrangements). A user's group will be set up, and I will sell software written by others for the POL/PS on a royalty basis. For more information, or to order items, contact:

His Programs c/o Mark Finger 2439 Overlook Circle Lawrence, KS 66044

# BUTE back issues for sale

|       | 1976 | 1977   | 1978   | 1979   | 1980   | 1981   | 1982   | 1983   |
|-------|------|--------|--------|--------|--------|--------|--------|--------|
| Jan.  |      | \$2.00 |        | \$2.75 | \$3.25 | \$3.25 |        | \$3.70 |
| Feb.  |      |        | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 | \$3.70 |
| March |      |        | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |        |
| April |      |        | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |        |
| May   |      | \$2.00 | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |        |
| June  |      | \$2.00 | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |        |

Circle and send requests with payment to: **BYTE Back Issues** P.O. Box 328

Hancock, NH 03449

| □ VISA | ☐ Master Card |
|--------|---------------|
| Card # | Exp.          |

|       | 1976   | 1977   | 1978   | 1979   | 1980   | 1981   | 1982   | 1983 |
|-------|--------|--------|--------|--------|--------|--------|--------|------|
| July  | \$2.00 | \$2.00 | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |      |
| Aug.  | \$2.00 | \$2.00 | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |      |
| Sept. |        | \$2.75 | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.70 |      |
| Oct.  |        |        | \$2.75 | \$2.75 | \$3.25 | \$3.25 |        |      |
| Nov.  | \$2.00 | \$2.75 |        | \$3.25 | \$3.25 | \$3.25 | \$3.70 |      |
| Dec.  | \$2.00 | \$2.75 | \$2.75 | \$3.25 | \$3.25 | \$3.25 | \$3.70 |      |

The above prices include postage in the US. Please add \$.50 per copy for Canada and Mexico; and \$2.00 per copy to foreign countries.

- \*Payments from foreign countries must be made in US funds payable at a US bank.
- \*Please allow 4 weeks for domestic delivery and 8 weeks for foreign delivery.

| name    |           |
|---------|-----------|
| address |           |
| city    | state zip |

# **CALL TOLL FREE**

| AIARI             |    |
|-------------------|----|
| Special 800 Syste | em |

| Special 800 System                   |
|--------------------------------------|
| 800 w/48K, recorder, Pac Man or      |
| Star Raiders, joysticks              |
| Pac-Man Special                      |
| 400 w/16K, 2 joysticks, Pac-Man Call |
| 800 (48K)\$ <b>525</b>               |
| 400                                  |
| 810 Disk Drive\$ <b>440</b>          |
| 850 Interface \$170                  |
| 410 Recorder                         |
| 830 Modem\$155                       |
| 16K Memory\$60                       |
| 32K Memory\$75                       |
| PRINTERS                             |
| Anadex                               |
| 9620\$1445                           |

| 16K Memory32K Memory         | \$60<br>\$75 |
|------------------------------|--------------|
| PRINTERS                     |              |
| Anadex                       |              |
| 9620                         | S1445        |
| C-Itoh                       | <b>+</b>     |
| F-10—Parallel                | \$1350       |
| F-10—Parallel<br>F-10—Serial | \$1350       |
| 55CPS—Series                 | Call         |
| 8510 Parallel                | S425         |
| Computer International       | 9723         |
| Daisywriter 2000 w/16K       | 64000        |
| Daisywriter 2000 w/48K       | \$1000       |
|                              | 31023        |
| Comrex                       | 6000         |
| CR-1-S                       | 3000         |
| CR-1-P                       | \$//3        |
| Datasouth                    | C447E        |
| DS 180                       | \$11/5       |
| Diablo                       |              |
| 620 RO wo/Tractors           | \$1100       |
| 630 RO wo/Tractors           | \$2050       |
|                              | \$2435       |
| IDS                          |              |
| Microprism 480               | \$525        |
| Epson                        |              |
| All models                   | · · · · Call |
| NEC                          |              |
| PC-8023A                     | \$465        |
| 3510                         | Call         |
| 3550                         | S1855        |
| 7710                         | \$2075       |
| 7720                         | \$2425       |
| Okidata                      | . – . – .    |
| Microline 80                 | Call         |
| Microline 82-A               | Call         |
| Microline 83-A               | Call         |
| Microline 84                 | Call         |
| PMC                          |              |
| DMP-85                       | \$410        |
| Smith-Corona                 |              |
| TP-1                         | S650         |
| Star Micronics               |              |
| DP-8480S                     | S300         |
| DP-8480P                     | \$295        |
| Gemini-10                    | Call         |
| Tally                        |              |
| 1805/1802                    | S1490        |
| 1805/1802<br>1605/1602       | \$1325       |
| MT 160I                      | 5585         |
| MT 160I                      | ŠÃÕÕ         |
| WIT 100L                     | 4550         |

MT 180......

**Texas Instruments** 

# SPECIAL OF THE MONT

Maxell Diskettes 51/4" O Sector (100) . . . . \$235

|               | SOFTWARE          |          | NARE                 |              |             |
|---------------|-------------------|----------|----------------------|--------------|-------------|
|               | CP/M              | IBM      |                      | CP/M         | IBM         |
| Ashton-Tate   | Call              | Call     | Sorcim Supercalc     | <b>\$225</b> | <b>S225</b> |
| WordStar      | Call              | Call     | Innovative           |              |             |
| MailMerge     | Call              | Call     | Software T.I.M.      | \$425        | <b>S350</b> |
| SpellStar     | Call              | Call     | CBasic               | \$100        | NA          |
| Visi-Calc     | NA                | \$195    | Microsoft Basic 80   | S265         | NA          |
| Easywriter II | NA                | \$275    | WordStar, MailMerge  |              |             |
| Spellquard    | \$225             | \$225    | SpellStar            | Call         | Call        |
|               | PLEASE ADD \$5 PE | RSOFTWAR | EORDER FOR SHIPPING. |              |             |

| DISK DRIVES               |         |
|---------------------------|---------|
| Percom                    |         |
| Atari S/D 1st Drive       | .\$400  |
| Atari S/D 2nd Drive       |         |
| Atari D/D 1st Drive       | \$525   |
| Atari D/D 2nd Drive       | \$330   |
| Rana (Drives for Apple)   |         |
| Elite 1                   | .\$345  |
| Elite 2                   | .\$475  |
| Elite 3                   | .\$550  |
| Controller (w/Drive only) | \$75    |
| MONITORS                  |         |
|                           |         |
| Zenith                    | 6445    |
| 12" Green Screen          | . 3113  |
| Amdek                     | C44E    |
| Video 300                 | 6240    |
| Color I                   | . 33 10 |

| Controller (w/Drive only) | >/5         |
|---------------------------|-------------|
| MONITORS                  |             |
| Zenith                    |             |
| 12" Green Screen          | .\$115      |
| Amdek                     |             |
| Video 300                 | .\$145      |
| Color I                   | .\$310      |
| Color II                  | .\$650      |
| Color III                 | .\$390      |
| BMC                       |             |
| 12" Green                 | \$85        |
| 13" Color                 | .\$265      |
| Comrex                    |             |
| 13" Color Composite       | .\$290      |
| 13" RGB                   | .\$455      |
| NEC                       |             |
| JB 1201                   | .\$155      |
| JB 1260                   | .\$115      |
| USI                       |             |
| 9" Amber                  | \$130       |
| 12" Amber                 | .\$150      |
| MODEMS                    |             |
| Hayes Smartmodem          | S215        |
| Novation                  |             |
| CAT                       | <b>S140</b> |
|                           |             |

D-CAT.....

Signalman

Mark I...

# **VIDEO TERMINALS**

| lelevideo  |         |
|------------|---------|
| 910        | .\$570  |
| 910 Plus   | . \$570 |
| 920        | . \$735 |
| 925        | . \$730 |
| 950        | .\$915  |
| Zenith     |         |
| Z-19       | .\$680  |
| ZT-1       | \$550   |
| COMPLITEDS |         |

| ZT-1                      | \$550           |
|---------------------------|-----------------|
| COMPUTERS                 |                 |
| Altos<br>ACS 8000-15      | 62742           |
| Series 15D                | .33742<br>S2125 |
| Series 5-5D               | \$4240          |
| Eagle                     | .\$2350         |
| NEC                       |                 |
| 8001                      | . \$730         |
| 8012                      | \$470           |
| 8031                      | \$730           |
| Northstar                 | 60000           |
| AdvantageAdvantage w/5MB  | \$ <b>2000</b>  |
| Horizon II 64K QD         | 52625           |
| Sanvo                     | . 42025         |
| MBC-1000 w/WordStar, Calc | Star.           |
| S-Basic, CPM®             |                 |
| Above w/2 Drives          | Call            |
| MBC-2000                  | .\$2460         |
| Televideo Systems         |                 |
| TS-802                    | .\$2600         |
| TS-802H                   | .\$4450         |
| Zenith                    | 62400           |
| Z-120                     | .33130          |
| 4-110                     | . 40 1 10       |

.\$180

2222 E. Indian School Rd. Phoenix, Arizona 85016

**COMMODORE** 

VIC-20.....

Datacassette.....\$60

Single disk drive.....\$320 16K Memory......\$95

Other Information: 602-954-6109 Order Line: 1-800-528-1054 Order Line Hours: Mon.-Fri. 10-5 MST Saturday 9-1 MST

\$85

# Hewlett-Packard introduces decision su for engineers. And a way to take yo

For a computer to be really personal, it's got to work the way you work. And solve your kinds of problems. Obviously, no one computer can do it all.

So we created six different series of personal computers - ranging from pocket-sized to super-powered - with an equally diverse list of features.

Today, we're introducing three new computers to the line.

So now, you can choose a computer that's not only "personal" by our definition...but by yours.

## Fast answers for decision-makers.

Now, managers can get the information they need, whenever they want decision-maker needs. A powerful database management system ... WordStar\* word processing...and VisiCalc, the electronic spreadsheet. But unlike some other personal computers, it takes just one keystroke to give commands - instead of two or three. That saves you a lot of time ... and frustration.

# The best of both worlds for scientists and engineers.

As a scientist, designer or engineer,

you've always had two choices. Big power...or personal size. Not both.

Now, you can have a computer that's powerful enough to handle design, computation and testing. And small enough to fit on your lab bench or desk-along with everything else you've got on it.

It's HP's new Series 200, Model 16. The Model 16 has the power, memory and graphics capabilities you've asked for. (8 MHz, MC6800 microprocessor. 16/32 bit architecture.



# pport for managers. A powerful new tool ar office with you anywhere you go.

Memory expandable up to 768K bytes. 300 x 400 pixel screen resolution.)

And it also has some extra features you probably wouldn't expect. There are three languages to choose from enhanced BASIC, compiled Pascal and HPL. And a comprehensive library of software packages to go with them. We built HP-IB and RS232 interfaces into the machine. (So you can attach peripherals or instruments without adding I/O cards.) And we even included a special rotary control knob that lets you adjust instruments or control motor speeds the same way

you'd tune in a radio station.

# Portable power for the professional on the move.

If you spend as much time out of your office as in it, you'd probably like a way to take your office with you. Now you can – with HP's Series 70, Model 75. It's a powerful, battery-driven computer that fits in your briefcase.

With its typewriter-like keyboard, 16K RAM (expandable to 24K) and 48K ROM, the HP-75 acts like a fullsize desktop computer. But it's just a little larger than an airline ticket folder. And it weighs only 26 ounces.

What can such a small machine do? In-

computer can do. Except it can do it while you're sitting on a plane.

Back down on the ground, you can use the HP-75's HP-IL interface to hook up a video monitor, TV screen, printer or plotter.

You'll be glad to know that the HP-75's price tag is easy-to-take, too. The basic package comes in at under \$1,000\*

# The right tool for the job.

The rest of the Hewlett-Packard family of individual computers includes pocket-sized professional calculators, powerful hand-held computers, portable computers and personal office computers. Each has its own special



# PERIPHERALS UNLIMITED Fantastic Prices!

Our fast service, product selection and our customers' satisfaction make us #1.

# **NEC Printers**

| 7710  | Spinwriter R/O         | \$2145 |
|-------|------------------------|--------|
| 7720  | Spinwriter KSR         | \$2495 |
| 7730  | Spinwriter R/O         | \$2145 |
| 7700  | Bi-directional Tractor | \$250  |
| 7700  | Ribbons                | \$5    |
| 3510  | Spinwriter             | \$1545 |
| 3515  | Spinwriter             | \$1699 |
| 3530  | Spinwriter             | \$1545 |
| 3550  | Spinwriter             | \$1899 |
| 3500  | Bi-directional Tractor | \$225  |
| 3500  | Ribbons                | \$14   |
| NEC 1 | Thimbles — All Styles  | \$18   |
|       |                        |        |

# **NEC Dot Matrix**

| PC-8023 | A-C     | \$474 |
|---------|---------|-------|
| PC-8023 | Ribbons | \$14  |

# **Okidata Printers**

| Okidata Microline 82A      | \$439  |
|----------------------------|--------|
| Okidata Microline 83A      | \$679  |
| Okidata Microline 84P      | \$1069 |
| Okidata Microline 84S      | \$1099 |
| Tractor (Oki 80 & 82 Only) | \$60   |
| Okidata Okigraph           | \$85   |
|                            |        |

Call for prices on ribbons

# **Diablo Printers**

| Diablo 620                        | \$1349 |
|-----------------------------------|--------|
| Diablo 620 Bi-Directional Tractor | \$175  |
| Diablo 630 RO                     | \$1999 |
| Diablo 630 KSR                    | \$2700 |
| Diablo 630 Bi-Directional Tractor | \$275  |
| RS232 Cable                       | \$35   |
|                                   |        |

Call for prices on ribbons

# **NEC Monitors**

| NEC JB1201 | GRN Phosphor | \$149 |
|------------|--------------|-------|
| NEC JC1201 | Color        | \$339 |

# **Epson Printers**

| MX-80 w/Graphtrax Plus   | \$449 |
|--------------------------|-------|
| MX-80FT w/Graphtrax Plus | \$529 |
| MX-100 (15" Carriage)    | \$684 |
| Grappler Plus Interface  | \$129 |
| MX-80 Ribbons            | \$12  |
| MX-100 Ribbons           | \$18  |

Call for prices on interfaces & cables

# **IDS Printers**

| IDS Microprism        | \$539  |
|-----------------------|--------|
| IDS Prism 132         | \$1449 |
| IDS Prism 132 w/color | \$1659 |
| IDS Grappler          | \$129  |

# **Amdek**

| Amdek 12" 300 GRN Phosphor       | \$149 |
|----------------------------------|-------|
| Amdek 13" Color I                | \$319 |
| Amdek 13" Color II               | \$739 |
| Amdek 13" Color III              | \$429 |
| Amdisk 3 <sup>-</sup>            | \$749 |
| (3" Dual Microfloppy Storage for |       |
| APPLE II & IBM PC)               |       |

For service, quality and delivery Call toll free

1-800-343-4114

**Ordering information:** Our order lines are open 9 A.M. to 5:30 P.M. EST Monday through Friday. Phone orders are welcome; free use of Mastercard and VISA. Personal checks require 2 weeks clearance. Manufacturer's warranty included on all equipment. Prices subject to revision. C.O.D.'s accepted. All U.P.S. shipments are subject to a shipping charge of 1% of the total purchase, with a minimum charge of \$5.00.

# PERIPHERALS UNLIMITED

(617) 655-7400

62 North Main Street, Natick, MA 01760

346 BYTE February 1983 Circle 332 on Inquiry card.

# **User's Column**

# Confessions, Pascal Prime, Wescon, and Perfect Writer

Our resident critic comments on Wescon and text editors.

Jerry Pournelle c/o BYTE Publications **POB 372** Hancock, NH 03449

First a confession: I don't really hate Pascal. Indeed, I never did, as will become clear shortly. I have tried to keep an open mind about languages. Apparently that's not enough for some of my correspondents; just as LISP addicts don't want to hear about Pascal. Pascal lovers don't want to be told that anyone might consider CB-80—a form of BASIC for God's sake!—to be in competition with their beloved.

Nor, apparently, are they willing to believe there may be defects in the language. Sigh. But there are, and in a later section we'll look at something practical that can be done about them.

Second, a problem: BYTE has a long pipeline. I'm writing this in late September, for publication in the February issue. Much of the mail I've received (bundles and bundles of it: ye gods!) is in response to the September issue. But when you read this, most of you will have seen the October, November, December, and January columns and have totally forgotten about the issues raised in September: which is why I must ignore much of my mail. I haven't time to answer very many individual letters (John Carr does some, but he hasn't a lot more time than I do), and, given the pipeline, many of the guestions asked will be moot before an answer can appear in BYTE.

E'en so, there's much of importance in my unanswered mail file; later on, I'll deal with some of that.

The BYTE pipeline is longer than I like; but there is a bright side. About two months before the magazine comes out, I get galley proofs of my articles; and provided that I'm not too wordy, I can insert a couple of last-minute announcements, letting these columns stay reasonably up to date. It's not an ideal system, but it's about the best we're going to get.

## Zeke Lives!

Mark Twain had the extraordinary experience of reading his own obituary, after which he said, "The reports of my death are greatly exaggerated."

Fortunately, Ezekial, my friend who happens to be an ancient Cromemco Z-2, can say the same. After his trip to Tony Pietsch's place, he returned nearly as good as new.

Nearly: a faulty cable managed to short out an input/output board,

which in turn rendered one of his bus slots inoperable; and we do have an annoying problem with the B disk drive. Tony says the disk problem could probably be fixed by lowering the entire drive system into a vat of TCE (a dry-cleaning solvent) and agitating it for a couple of hours; in the absence of that, we just live with "Please Close Drive Door" the first few times we try to access the B drive. The problem goes away after a few minutes' warm-up.

Update: last night Zeke died again, clobbering all his disks as he did. Today, in despair, I took apart the old iCOM disk system. Lo! I found that there's a bad cable that conveys the 5-volt power; this causes all kinds of weird results, including write operations when the computer is supposed to be reading. Tony Pietsch thinks this is fixable, and thank heaven! I'm just now writing this on the Televideo 950 terminal, and that misplaced Delete key, plus the obscene Back Tab key, will soon drive me out of my mind.

I mention Zeke's revival in part because my mail indicates considerable interest in his health, but in fact there's an illustrative lesson here.

This ancient machine—he was built some five years ago—is still plenty good enough for me to write this article with. When I first got Zeke, we had dying chip problems and a mysterious gremlin that required exorcism; but after the first couple of months, there just weren't any problems at all. Even now, the central machine is in good shape; all our recent problems have been caused by faulty cables.

This seems to be typical: once past the first few months, you shouldn't have any problems for several years. Then, all at once, like the wonderful one-horse shay, everything may collapse. Actually, the electronics could last for decades; it's mechanical stuff—disk drives, switches, fans, cables, connectors, etc.—that goes.

The problem is that five years isn't long in the life cycle of a typewriter; but it's an eternity for a microcomputer. By the time you need repairs on your ancient equipment, the manufacturer will no longer be making it, and it's likely that none of the

technicians will ever have heard of it. This may change when machines begin to sell in hundreds of thousands per model; but just now it seems true enough.

I've no regrets. I've got a lot out of old Zeke, and he may yet last another couple of years; but computer purchasers should be warned: things are moving very fast, and that has consequences.

Meanwhile, I know of only one way to avoid the early (infant mortality) glitches, and that's to buy "used" equipment; that is, either stuff that's been burned in a lot, like Compupro's rather expensive CSC grade, or literally used equipment, if you can find someone reliable to buy it from. (One outfit sends out evaluation hardware with the understanding that they'll swap every month or so: that way they get back a thoroughly tested machine.)

# The Pascal Prime Project

As I've mentioned before, one of our major projects was Alex's Pascal

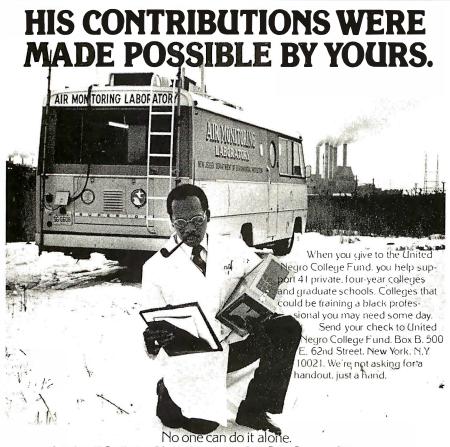
Intro. It was intended to be a simple little job, but it ended up taking most of the summer. It also had interesting fallout: in order to test it, I had to write a couple of fairly hairy programs in Pascal. One, a game called Imperial Trader, got out of hand, but eventually I finished it. While writing it, I learned more about Pascal than I'd intended to.

Conclusions first: once you get the hang of it, there's a lot to like about Pascal. My game, for instance, darned near wrote itself once I dreamed up the structure for keeping track of all the important game entities, such as players, planets, products including arms and drugs, prices of products on each planet, police and customs officers, etc. Pascal lets you define your own variable types; in particular, you can define records that let you put about 20 different items-some strings, some integers, some real numbers, and some arrays of other stuff-all in one variable. Thus, it's a cinch to get at all the vital data you want: read it, update it, play with it . . .

The best BASIC in the world can't do that. BASIC requires you to have a bunch of arrays, and you can't mix string, character, integer, real, and Boolean variables in the same array—much less can you have an array that contains subarrays the way Pascal records can.

I probably ought to quote Marvin Minsky (MIT computer expert) here: Marvin says that Pascal sacrifices programmer options in order to force programmers to write readable code. He's right, too; the question is whether the gain is worth the cost. I think so. Marvin doesn't.

Of course, Minsky is primarily interested in artificial intelligence, in particular in programs that modify themselves (and thereby are intentionally unpredictable in their results), while this column is mostly directed to people who want to use their computers to accomplish some definable result. For AI and hefty experiments in computer science, you need to learn a list-processing language, which in practice means LISP or a derivative; but for getting today's work done, I'm coming to the



GIVE TO THE UNITED NEGRO COLLEGE FUND.

A mind is a terrible thing to waste.

A public service or this magazine and The Advertising Council.





# Gives your application a head start

AMX can save you time and money. You can capitalize on our years of multitasking experience. Start your application using a software executive proven with three years of fault-free operation.

Professional software designers use AMX as the starting point for their product and system designs. AMX shields them from the difficulties of managing the micro, freeing them to concentrate on their application.

## SIMPLE OPERATION

Complex control programs are divided into a number of separate, more manageable programs, called *tasks*, each designed to do one job. Tasks are written and tested separately and then combined to form a reliable, finished system.

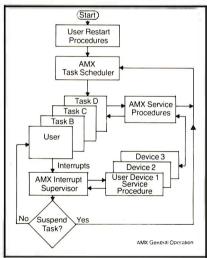
AMX supervises the orderly execution of these tasks, assuring that the most important jobs always get done first. Tasks appear to be executing simultaneously. It's almost like having a separate CPU for each task!

# HARDWARE INDEPENDENCE

AMX does not require a particular hardware configuration. You control

your environment. You pick the I/O method. You decide the preferred interrupt service technique for your system. AMX will support your choice.

AMX is fast, compact, and ROMable. Even though the AMX nucleus is less than 1400 bytes in size, it features multiple task priorities, intertask message passing with priority queuing, external event synchronization, and interval timing.



CP/M is a trademark of Digital Research Corp. Z80 is a trademark of Zilog Corp.

Interface modules are available to allow AMX to be used with C, PASCAL, PL/M. FORTRAN and assembler.

Access to CP/M® disk files in real time is possible using the AMX I/O Supervisor.

## **COMPLETE DOCUMENTATION**

AMX can be judged by the quality of our documentation.

We deliver AMX source on diskette to permit AMX to be moved to the software development system of your choice. Our liberal license agreement permits binary (object) distribution without royalties.

## **HOW TO ORDER**

A specification sheet and price list are available, free. Your check or money orderfor \$75 will purchase the AMX Reference Manual for immediate evaluation (specify 8080, 8085, Z80 or 6809 processor). Add \$25 for postage and handling outside USA and Canada. The standard AMX Multitasking Executive package, including source code, is \$800.

AMX is the choice of professionals the world over. Make it yours, today.

# 非 KADAK Products Ltd. 非

206-1847 W. Broadway Ave., Vancouver, B.C., Canada V6J 1Y5 Phone: (604) 734-2796 Telex: 04-55670

Circle 225 on Inquiry card.

conclusion that Pascal is my first choice.

However: for all its attractive features, Pascal has some very severe limits. I've discussed many of these before. The I/O system doesn't make sense, and Pascal thinks that the ideal file is a reel of magnetic tape; it has no provision for the kind of random access you can do with disks.

Some of Pascal's worst theoretical limitations have been overcome in practice, as compiler writers tuck in

various nonstandard extensions. The problem with that is we're getting many dialects of Pascal, which severely limits our ability to transfer programs from one machine to another.

Fortunately, though, it isn't hard to overcome many of those limits. Compiler writers tell me they can continue to extend Pascal with little difficulty. The problem is to come up with a "standard" set of extensions, so that programs will remain more or less

portable: and that brings us to Project Pascal Prime.

I've put together some extensions that look interesting; added to "standard" Pascal they create Pascal Prime, a user-oriented language. There will be a discussion of Pascal Prime during the West Coast Computer Faire; as a default case I'll be chairman, although I'm willing to hand that over to anyone better qualified who wants the job. Mostly, I want to bring together people interested in microcomputer Pascal and have a serious discussion of a "standard" extension package.

The meeting has already drawn promises of attendance from several of the major publishers of microcomputer Pascal compilers; if just those who say they're coming can agree, we'll have Pascal Prime de facto.

# Candidate Pascal Prime Features

For those uninterested in Pascal, my apologies if the following gets more technical than you've come to expect from me; I wouldn't do it if I didn't think it important.

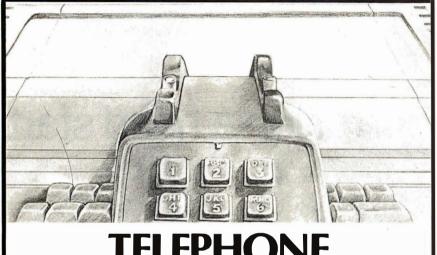
The first criterion for Pascal Prime is that we don't do *much*. One of Pascal's best points is that it isn't a complex language. We do *not* want to end up with something like the Department of Defense's new language, Ada. Ada was designed by a committee, and it shows; it has hundreds of "features," some absolutely obscure. Pascal Prime will, we hope, stay within the spirit of the original language.

Second, we want programs written in previous Pascals to compile under Prime.

Third, Prime is intended for microcomputers; but we'd like Prime programs to compile on larger systems. Changes will be needed, but we want to keep them to a minimum.

Here are some candidate extensions; discussion is invited.

1. STRING and LONG STRING data types. Most Pascal implementations have type STRING, which stores the string length as the first byte (BYTE 0). This can become standard (certainly type STRING is vital), but this method of implementation limits string lengths to 255 characters

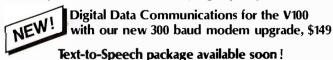


# TELEPHONE VOICE RESPONSE

The V100 Telephone Voice Response Unit with telephone interface is an Apple II® or IBM Personal Computer® compatible, low-cost solution to remote data base access arrangements.

\$39500

- Direct telephone connection, auto-dial/answer
- Touch-tone® generation and detection
- Includes 300 word, LPC vocabulary
- Software for sentence/library construction
- Expandable with 1300 (\$495) high quality LPC words



For a voice demonstration call toll free (800) 538-7002 In California call (408) 942-1595



160B Albright Wy. Los Gatos, CA 95030 (408) 370-0555

350

Sonics Micro Systems announces the commercial availability of S.D. Systems'

# First "Disc-Less" Micro Computer System. \$1050

- 1. Replaces Floppy Disc Drives.
- 2. CP/M,MP/M, Oasis and Turbo-Dos compatible.
- Transparent to operating system disc commands.
- 4. No moving parts, no alignment, no media failures.
- 5. Network ready.
- 6. FAST!!!!!!!!!!!!!

# "Ram-Disc" \$630

- Operating under CP/M the "Ram-Disc 128" functions as a fully compatible floppy drive replacement. Maximum single board configuration of 256K Bytes offers the equivalent capacity of 8" floppies. If more local disc image storage is necessary the Ramdisc system may be expanded to a full 40M Bytes.
- Whether operations require the "Ram-Disc 128" to operate as a floppy replacement or as a high speed data acquisition system is

solely dependent on single system configuration.

 In real time data acquisition and subsequent processing applications the "Disc-less" system approach affords mini computer speed and versatility at micro computer prices.

# "Rom-Disc" \$289

- The "Rom-Disc-128" is a direct replacement for floppy disc drives used for the purpose of booting the CP/M operating system. Further the "Rom-Disc-128" is a direct replacement for floppy disc drives used to load and store applications programs.
- A total lack of sensitivity to the storage and handling parameters of standard floppy discs make the "Rom-Disc-128's" media virtually "immune" to familiar system failures.
- Under popular CP/M utilities the "Rom-Disc-128" appears as a simple disc drive.
- With CP/M configured in the S.D. Rom format, systems boot in less than 1/10 of a second.
- Equipped with a high speed RS-232 serial port the "Rom-Disc-128" will accommodate

data transfer to and from the host.

- The "Rom-Disc-128" in conjunction with the previously described "Ram-Disc-128" provide true system portability and independence from floppy disc drives.
- Each "Rom-Disc-128" may be attached to a 256K Byte applications "personality module" allowing maximum system flexibility and personality. "Rom-Disc-128" because of its very nature offers "maximum" protection from software piracy.

# "Turbo-Dos" \$350

Z-80 CP/M compatible network ready Turbo-Dos in stock, ready for immediate delivery.

# Versa Floppy II "With CP/M 3-0" \$475

• Supports dual 5¼", dual 8" or both. "CP/M 3-0" included.



FORT LAUDERDALE, FL 33309

1-800-327-5567 IN FLORIDA CALL: 305-776-7177

at Sonics "We are Technology"

on 8-bit machines. This is often annoying, and makes it difficult to work with text. If we had type LONG STRING, which would use 2 bytes for the string length, it would make things easier. (For larger machines, you make things portable by changing all the LONG STRING variables to type STRING—a moment's work.)

- 2. A default for the CASE statement. Again, almost all implementations have this feature although it was not defined in the standard. We suggest the reserved word OTHERWISE to follow the last case; OTHERWISE rather than ELSE to avoid confusion with IF statements.
- 3. The compiler should ignore the underbar (\_\_) character, so that you can use variable names like fist\_\_of\_\_god and first\_\_boy for clarity, but not have to remember the underbars when you just want to write firstboy.
- 4. Static variables: variables local to a procedure, but which don't go away when you exit the procedure.

- Seed for a random-number system is a perfect example: nothing outside the procedure needs to get at the seed, so seed shouldn't be global; but clearly it must stay around between calls to the random function.
- 5. Allow functions to return REAL and STRING values. Why shouldn't they?
- 6. The lack of a BREAK statement needs discussion; see my November column. It's desirable to have a way out of a loop without keeping track of dummy variables, but BREAK can be abused. We probably need one, but it should be tamed considerably. Design of a BREAK that fits into the spirit of Pascal needs some thought.
- 7. Ucase and lcase, which convert strings to uppercase and lowercase respectively, ought to be standard procedures (or functions if we can get functions to return strings). They're often needed, and the usual function writer slows things down a lot when writing these.
  - 8. Do we want dynamic arrays

(redimensionable during run time)? They are convenient, but they're somewhat against the spirit of the language. The lack of redimensionable arrays has annoyed me from the time I first began to study Pascal.

- 9. We definitely need standards for separate compilation and for "include" statements. Using pseudocomments, such as {\$I+} and the like, is currently done in most microcomputer Pascal implementations, and although a bit ugly, is acceptable; what's needed is a standard way of implementation.
- 10. The ISO Standard Pascal permits files almost anywhere. They are particularly necessary in records. Of the microcomputer implementations, Pascal MT+ allows files in records, while most, including UCSD Pascal, don't. It's important to have files in records, because it makes disk operations so much easier.
- 11. Constant definitions ought to permit elementary arithmetic. Complex arithmetic in the CONST declarations shouldn't be allowed, but foo = 5; foobar = foo + 3; definitely ought to be permitted. You certainly should be able to say bell = chr(7).
- 12. Pascal should permit you to read and write enumeration types. That is:

**TYPE** 

VAR

today: day

and later in the program, the operation

today := tuesday; write(today);

will fail. This is monstrously inconvenient, requiring you to have an array of day names (which you can name dayname), and then write dayname[ord(today)], which is awkward at best.

13. There ought to be ways for a programmer to set up a stack and get at it. This needs thought lest it make

# Deatort It

Without SAFEWARE," you could be uninsured. For as little as \$35 a year, SAFEWARE provides complete protection for all hardware, media and purchased software. Both business and home application. Call toll free today for more information or immediate protection. Columbia National General Agency, 88 E. Broad, Columbus, Ohio 43215. (In Ohio call 1-800-848-2112)





IBM Series III Model 10 \$22,635

# Xerox and IBM give you copies as good as the Minolta EP 300.

They just cost more.

When we say Xerox\* and IBM\* give you copies as good as the Minolta EP 300 we're being modest.

Because 74% of consumers interviewed by Nationwide Consumer Testing Institute said the copies produced by the EP 300 were clearly superior.

So, while the Xerox and IBM certainly do bigger jobs, they don't do better jobs than the Minolta EP 300 when it comes to copy quality

The EP 300 has Minolta's exclusive micro-toning system. So its copies are extraordinarily crisp and clear. With blacker blacks. From top to bottom and edge to edge. On virtually any paper

edge to edge. On virtually any paper up to 10 x 14"

There's also an electronic troubleshooter to spot and prevent problems. And a universal tray so you can change paper sizes without changing trays. It's all in a copier hardly larger than an office typewriter.

If you'd like the test results, send us the coupon.

If you'd like the name of your nearest

therized Minelta dealer, look under

authorized Minolta dealer, look under our trademark in the Yellow Pages. Or call toll-free 800-526-5256. In N.J., 201-797-7808.

The Minolta EP 300. The small copier that proves size isn't everything.

The Minolta EP 300. At up to 10 times the price, we'd still look good.

©1982 Minolta Corporation. Product appearance and/or specifications subject to change without notice Xerox® and IBM® are registered trademarks of Xerox Corporation and International Business Machines Corporation, respectively. Prices are those in effect as of 7/1/82



MINOITA



City\_\_\_\_State\_\_\_\_

☐ Please send me the copy test results.

☐ I'd like more information. Please have my

Zip\_\_\_\_\_\_Telephone\_\_\_\_\_

Mail to Minolta Corporation, Business Equipment Division 101 Williams Drive. Ramsey. NI 07446

programs too obscure.

14. We need a way to put variables in a specific place in memory and to reserve blocks of memory. This will of course be machine-dependent, but it's very desirable, especially if you have memory-mapped video.

There are probably other desirable Pascal extensions. The criteria are that they stay within the spirit of the language, that they be easy to use, and that they don't make the programs unreadable. They should also be reasonably easy to implement.

The above have received widespread agreement among those I've spoken with, including compiler writers. Other candidate extensions, particularly some that would make Pascal more suitable to use for writing operating-systems programs, are likely to be more controversial and will need considerable thought. Some of those will be detailed next month. The idea is to get an agenda for the meeting at the West Coast Faire.

## Wescon and Mini/Micro

Wescon, September 14-16, filled the Anaheim Convention Center with more than 70,000 attendees. The Mini/Micro conference was held at the same time in the Disneyland Hotel. It attracted better than 10,000, plus a large number of Wescon attendees.

Wescon features high-technology components; I didn't spend much time there, although if I were trying to predict the future of the microcomputer world, I might have gotten some insights. I suppose the equipment on display will be in next year's systems, and I expect Ciarcia would have been fascinated.

I spent what little time I had at Mini/Micro, where several systems stood out. For me, the hit of the show was the new Heath/Zenith Z-100 computer. Readers may recall that I'm not much enamored of the IBM Personal Computer (incidentally, IBM wasn't at Mini/Micro). I don't like the Personal Computer because the bus isn't standard and the keyboard is badly designed.

Comes now Heath/Zenith: its product is what amounts to the Personal Computer on a six-slot (five slots free in the 128/192K-byte system) S-100 bus and with a good keyboard. The Z-100 is a dualprocessor 8085/8088 system. It has both black-and-white and color display drivers (no monitor) built in as standard features; all this for slightly more than \$4000. You have to buy your own monitor, from a \$150 green-and-black to about \$800 for color.

The keyboard is very nice: an IBM Selectric layout with enough extra keys to make the full ASCII (American National Standard Code for Information Interchange) character set, plus Control and Escape keys and programmable Function keys. All keys have automatic repeat but with a twist: a "hyperspace" key makes autorepeat really fast.

There's more. The Z-100 comes with dual 51/4-inch disks that read and write IBM Personal Computer format (as does my Compupro); the Z-100's disk controller will also talk to 8-inch disks, meaning that all you need do is connect 8-inch drives with a standard cable and you have both disk-drive sizes up and running, and you can copy files from one to the other using PIP.

There's not a lot new in the Z-100; but it's an excellent implementation of what it is. (Bill Godbout was overheard to mutter that the Z-100 is one of the nicest machines his Compupro team ever designed.)

Heath will sell you both CP/M-86 and MS-DOS in a package with some other programs for about \$500. It also gives you extensive documentation about the machine. I'll have more to say on the system next month; I'm strongly thinking of getting one, and we're talking to Steve Calkins of the Central Los Angeles Heath Electronic Center. The only negative feature I noticed was that there's no detachable keyboard; that is, the monitor is separate, but the machine itself has the keyboard built onto the main computer. In profile, it reminds me a bit of the old Sol computers. That can make for mild space allocation problems, especially here in Chaos Manor where we're up to our clavicles in computers.

I also saw the new DEC Rainbow Personal Computer. Like the IBM, the DEC keyboard has those extra keys between the Shift and the "Z" and "/?" keys. The DEC salesman said, "There's a standard about to be adopted, and we do try to be reasonably standard." This "standard" comes from Europe. If it really took over here, every American touch-typist would have to learn all over again. I refuse. Fortunately, I suspect I can trust the marketplace to give me a "nonstandard" keyboard I can live with.

The Rainbow has a lot of extra keys, but no Escape key; the salesman said this was to avoid intimidating secretaries. I find that attitude, combined with use of a non-American keyboard, rather interesting.

I didn't get to spend a lot of time with the Rainbow. I'm sure there were a lot of things to like about it.

# Adelle Again

One reason I went to the Mini/Micro show was that Greg Decoteau of CTI Data Systems had promised to fix Adelle, my Otrona Attache. She wasn't working because I'd foolishly exposed her to an inadequate voltage converter in Rome.

"Bring it to the show," he'd said. "I'll take care of it there."

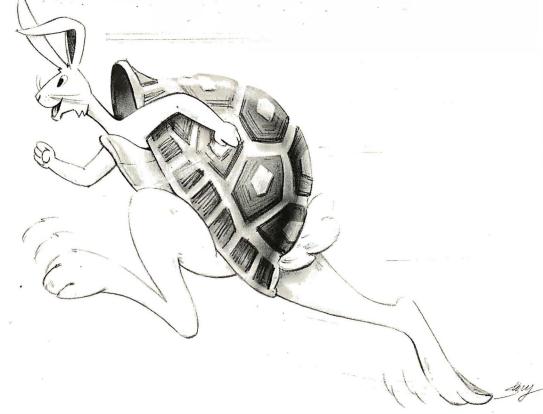
This didn't seem very reasonable, but it did promise to be interesting, so I brought the Attache to the show.

Set the scene: a booth with about 20 feet of frontage and 8 feet of depth. Several Attache computers, plus a Mannesmann Tally line printer, on display. Hundreds of people wandering past, looking over Greg's shoulder, asking questions.

And in 16 minutes, 14 seconds, Greg took the Attache apart, disconnected the power-supply unit, installed a new power-supply module, reassembled the computer, and turned it on. It worked fine. And he did all that using a Phillips screwdriver from one of those 89-cent tool sets.

Incidentally, the Otrona still knew the time and date, which had been set back at Chaos Manor before I went to Italy. There's a battery backup for that part of the Attache, so loss of

# WILD HARE REPROGRAMS THE TORTOISE



# **MORE GREAT NEWS FOR DATA GENERAL USERS!**

Speedy Hardware puts you out front. Our Enhancer Hardware series is designed to dramatically improve the overall response and throughput of your Data General systems. Designed to look like an incredibly fast disk drive to your operating system, it accesses its 1MB of data in 2.5 microseconds and transfers it at 2 megabytes/second. Make ICOS (CS/COBOL), RDOS and INFOS streak with a 30-day trial run. AOS/Enhancer available soon!

Productive Software wins the race! In the race for productivity, Wild Hare gives you that extra edge by multiplying the capabilities of your Data General system. Wild Hare's TSS operating system enhancements give Data General NOVA and ECLIPSE users the most from their system. TSS allows you to transform RDOS, ICOS (CS/COBOL) and INFOS into true multilingual, multi-user Time Sharing Systems.

This state-of-the-art system accommodates up to 26 users. Each user can independently edit, compile and execute programs using the language of his choice, like FORTRAN, ALGOL, BASIC, COBOL, Pascal, Assembler and more.

TSS combines RDOS, INFOS and ICOS compatibilities with AOS capabilities at a mere fraction of the cost. Try a 30-day trial runand get an even greater run for your money.

Wild Hare wins the marathon. Wild Hare has a new hardware/software scheme. It allows you to take advantage of the latest hardware and software technology, yet lets you preserve your valuable Data General user software investment. Our new "Hare Brain Scheme" is on the starting line, so watch for the latest solutions from Wild Hare. Our good ideas keep multiplying.

wild hare

power (or of the whole power supply) doesn't cause it to forget.

The machine was under warranty. so any dealer was authorized to repair it. (CTI isn't actually a dealer, it's in charge of marketing the Attache, and a number of other highquality products, in Southern California: but in this case CTI acted as a dealer would.) The Attache is built in modules (it was quite interesting to see the innards); dealers have modules, and service consists of replacing modules until the machine works. The dealer doesn't have to know much about electronics—Greg Decoteau doesn't. He's a marketing

The results are impressive.

Now that I've got it running again, I've found more to like about the Otrona. The Valet alarm feature is very handy, the graphics are really lovely, and one of these days I'll find a use for the Greek-letter character set that's hidden in there underneath one of the nicest Roman-letter sets I've seen.

There's even a calculator pad. If you hit Control-Shift Lock, the "U," "I," and "O" keys become number keys, while the "P" becomes a "plus," and other interesting transformations take place. You can get key tops that show this (although I don't have them yet). I suspect this is more a gimmick than a feature I'll use often, but it does make it very clear; the Otrona's keyboard can be completely reprogrammed. You could, I suppose, even introduce a Dvorak keyboard as an alternate feature.

Of course, the Kaypro II comes with a full number pad as extra keys.

# Yeah, But You're Different . . .

One chap at Mini/Micro said he reads my columns and likes them, but wonders if I don't get better service than the average customer.

That may be; although I try to have my machines taken in by one of the boys, or a student, many of the dealers know my equipment, and I'd be naive if I didn't suspect that a BYTE columnist is likely to be given

more attention than a walk-in.

There's not much I can do about that. I have to report what happens to me, and I can't do much more than that. I don't have the resources to run undercover investigations.

I do pay a lot of attention to detailed accounts of problems with software and equipment I've recommended in this column. I can't be the microcomputer world's ombudsman. but I can sometimes be the next best thing because I do know a lot of people in the computer business, and if I forward a letter it will usually be read. More than that I can't do.

# Text Editors and Perfect Writing

This started as a review of Perfect Writer, and ended up with a lot about editors in general.

I've mentioned EMACS before. That's the text editor developed at MIT for use on its PDP-11s and other "big" machines. Many years ago, about the time Larry Niven and I got computers, we visited MIT and were given copies of the EMACS documentation. It included pages and pages of commands, so many that I was a bit intimidated. I showed it to my mad friend, who shuffled through it for a few moments and laid it aside without comment.

"Not interested?" I prompted.

"What's the point?" Mac Lean asked. 'You won't get that running on our machines."

That situation has changed. At least two EMACS-like editors are now available for microcomputers: MINCE (MINCE is not complete EMACS), which I reviewed last year, and Perfect Writer, which isn't complete EMACS either, but is a pretty healthy subset of it.

# What Took You So Long?

I'm probably not the best person to evaluate text editors for several good reasons. First, I'm not really the typical user of editor programs. I use text editors for three purposes: writing programs, writing letters, and creative writing. I spend most of my time on the third task, and if a program doesn't work for that, I don't really care much about how good it is at writing letters.

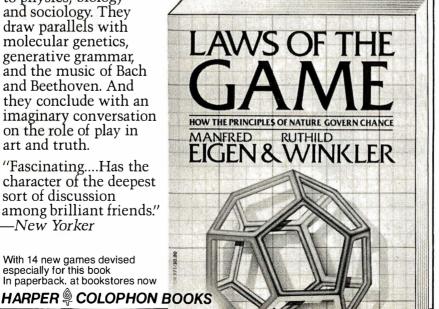
# Beyond "Gödel, Escher, Bach"

If you marveled at Gödel, Escher, Bach you're ready for LAWS OF THE GAME—the book that offers a challenging exploration of play as the expression of creativity in nature and culture. The authors analyze games ranging from chess and bridge to board games of their own devising, such as "Survival" and "Hypercycle," showing how games relate

to physics, biology and sociology. They draw parallels with molecular genetics, generative grammar, and the music of Bach and Beethoven. And they conclude with an imaginary conversation on the role of play in art and truth.

"Fascinating....Has the character of the deepest sort of discussion among brilliant friends." —New Yorker

With 14 new games devised especially for this book In paperback, at bookstores now





# IDE introduces the world's lowest priced IBM PC Winchester disk drives.

AtIDE, better technology leads to better pricing. Which is why we can offer you the lowest priced Winchester disk drives in the world. Without sacrificing performance or quality.

Our disk drives are as advanced as any you can buy. They're designed by one of the industry's leading innovators, SyQuest.

They're compact (3.9 in), use no more power than conventional floppies, and hold up to 5 MBytes of storage.

And they'll fit right into your IBM PC, or if you wish, stand alone as a self-contained unit.

What's more, you can order your drive with fixed or removable disk.

Here are our low prices: In-chassis fixed disk \$1450. In-chassis removable disk \$1500. Self-contained fixed disk \$1650. Self-contained removable disk \$1700.

And when you take advantage of our special offer, you'll save \$150 more.

# Why we cost less.

At IDE, we make only one type of product. Add-ons for the IBM PC.

By concentrating our efforts, we run our company more efficiently. And keep costs down.

We also eliminate things that drive costs up, like fancy showrooms and high-priced salesmen.

# Free installation and one year warranty.

If you live in a selected major metropolitan area, we'll install our products in your home or office. Absolutely free.

If you don't live in one of these cities, we'll send your product along with the documentation you need to install it within minutes.

And all IDE products come with a full one year guarantee.

Not just 90 days.

# Other IDE products.

You can also get a Combination Card from IDE. It comes with up to 256KB of memory plus your choice of up to 3 interfaces, including serial, parallel or SASI hard disk, and clock/calendar/battery.

Plus we offer you a complete line of memory products, including a 512KB board. All at IDE's low prices.

And with IDE's unique upgrade policy, you can trade in your current purchase toward another IDE product for the price differential plus \$25.

# Order today.

Cut out the coupon and take advantage of our special offer. And get the lowest priced Winchester disk at an even lower price. But hurry, the offer ends soon. For more information on any IDE products, call us at (617) 272-7360.

Do it today.

# And a way to make them even lower.

| Send me 5 MByte disk drive(s) In-chassis fixed disk Self-contained fixed disk Total charge \$ Mass. Residents add 5% Sales Tax |      | I have attached ☐ CHECK ☐ COMPANY P.O. Please charge my ☐ VISA ☐ MASTERCARD  Credit Card #:  Expiration Date  Signature |
|--------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------|
| Name                                                                                                                           | Com  | pany                                                                                                                    |
| Address                                                                                                                        | City |                                                                                                                         |
| State                                                                                                                          | Zip  | Phone # ( )                                                                                                             |

Circle 203 on inquiry card.

BYTE February 1983 357

For programming I use Wordmaster, and I've yet to see a better editor for that purpose. For letters I use whatever editor I use for creative writing, which may be a mistake, because my favorite editor isn't designed primarily for writing letters, and there may be some that are better for that purpose. (Tony says not so: that his latest version of WRITE will do the job beautifully.)

But my major need is for a "creative writer's editor." Indeed, the reason I bought a computer in the first place was that I'd seen Electric Pencil in operation down at a company that then called itself Computer Power and Light (it's now known as COMPAL). When I saw Electric Pencil, it was love at first sight. Pencil was shot through with terrible problems, but I didn't care. You can't imagine the joy I felt when I realized that I would never have to retype a whole page again! I could put up with all of Pencil's misfeatures (and plain bugs) forever just for that.

When I introduced my collaborator Larry Niven to the joys of writing with computers, he felt the same way. What did we care if Pencil wasn't very well written? For us it worked.

Fortunately, Mac Lean and Tony Pietsch weren't so easy to satisfy. They persuaded us to keep a log of things Pencil did that we didn't like and things we wished it would do that it didn't do. After about two years, Tony began writing a program that would take care of our problems, and in another year he had one he was willing to give us. That was WRITE 0.3; I am now using WRITE 1.6, while Larry, more conservative than I, is still using WRITE 1.51 or thereabouts. Either beats the stew out of Electric Pencil, and for a number of reasons WRITE is, in my judgment, the best *creative writer's* editor in existence-and that includes all machines, mainframes and minicomputers as well as microcomputers.

Just about a year ago, Tony was persuaded to market WRITE, and after he spoke to a number of companies, settled on Ashton-Tate. Now being published by Ashton-Tate is a big deal. It doesn't do things by halves. It doesn't release stuff that

isn't pretty solid, nor will it publish something that isn't expansible. It wants to compete with *everyone*.

Ashton-Tate can probably do that, too: but in order to make WRITE compete with all the other editors, it had to have features that neither Larry nor I ever dreamed of. That has taken time. Lots of time, more time than I ever thought it could take. Eventually I got worried, because I've mentioned WRITE in these columns and I get lots of mail about it, and all I can say is real soon now, which isn't much of an answer. So I have tried to persuade Ashton-Tate to release an early version of WRITE, one not so studded with features but intended primarily for creative writers. I hope this will happen, and maybe by the time this is in galley I'll know when,

# What Do You Mean, Writer's Editor?

For me, the primary requirement is that an editor must be *transparent*. When I'm writing I don't need distractions. I don't want my editor telling me things I don't need or want to know. In fact, I don't want to see *anything* up on that screen except my text. In particular, I *hate* it when the editor natters at me. Wordstar, for example, wants to tell me the line and column number every time I press a key. Why, I don't know. It isn't information I often need, and surely if I do need it I can ask for it.

Next, I want the editor to be like an "electric pencil"; that is, I want to be able to move the cursor rapidly across the page and write over the wrong words, insert new words, move stuff around, exactly as I did when I used a red pencil on my paper typescripts. (Then I had to retype the page. Ugh.) And I want to do all this without thinking about it.

That means I want cursor-oriented commands. When I'm editing on paper, I don't move the pencil forward by sentences, I just move it. And I particularly don't want to have to remember a huge slew of commands in order to get my work done. It's nice to have a lot of special features, but I want the simple, easy-to-remember commands reserved for the stuff I do all the time.

Of course, I've described the "philosophy" of Electric Pencil and WRITE, which works like Pencil with the bugs removed.

There are, however, different views of what makes a perfect editor.

## Perfect Writer

At long last, then, we can look at Perfect Writer.

Perfect Writer has many of the strengths and weaknesses of its parent EMACS. However, one of EMACS' strengths is not present: EMACS has online HELP features. If you're fairly sure there's a command that will do what you want, you can always ask, and generally EMACS will tell you. Alas, that's not present in Perfect Writer. I'm not sure why. WRITE has extensive HELP features.

Perfect Writer has cured one of EMACS' problems. At least in early versions of EMACS, the carriage return and linefeed that together make a NEWLINE character in the ASCII character set were treated as two different characters; and since commands in EMACS and Perfect Writer are character-oriented rather than position-oriented, the Control-f (move cursor forward one character) command did strange things at line ends, as did backspace. Perfect Writer doesn't have that problem, and the cursor moves at line ends exactly as it does anywhere else.

However, Perfect Writer retains all those character-oriented commands. You move forward or backward by lines, and because you must explicitly reformat your text (Perfect Writer, EMACS, and Wordstar are alike, and unlike Pencil and WRITE, in this regard), if you've made insertions, deletions, and changes in a line of text, what Perfect Writer thinks is a line can surprise the heck out of you. I have no doubt you can get used to it, but I'm not keen to.

One other thing I don't like about Perfect Writer is that it uses the kill buffer to move text. That is, whenever you delete anything larger than a single character, Perfect Writer stores that in a last-in/first-out stack, and the command Control-y (for yank) will get it back out for you. This makes undo or unkill easy in

Nobody offers you a wider variety of computer printers and printer experience than Facit/Dataroyal... all the way from low cost (\$695 list) matrix printers, to sophisticated graphics and color matrix printers, to models that print variable size characters and bar codes, to "daisy wheels" and a multimode near letter-quality printer. Industry standard parallel and RS232C serial interfaces are available in all printers.

Our products are built to perform day after day in the most rugged

environments. We achieve that kind of reliability by incorporating modern, trouble-free LSI circuitry, and fewer moving mechanical parts along with a high level of quality control.

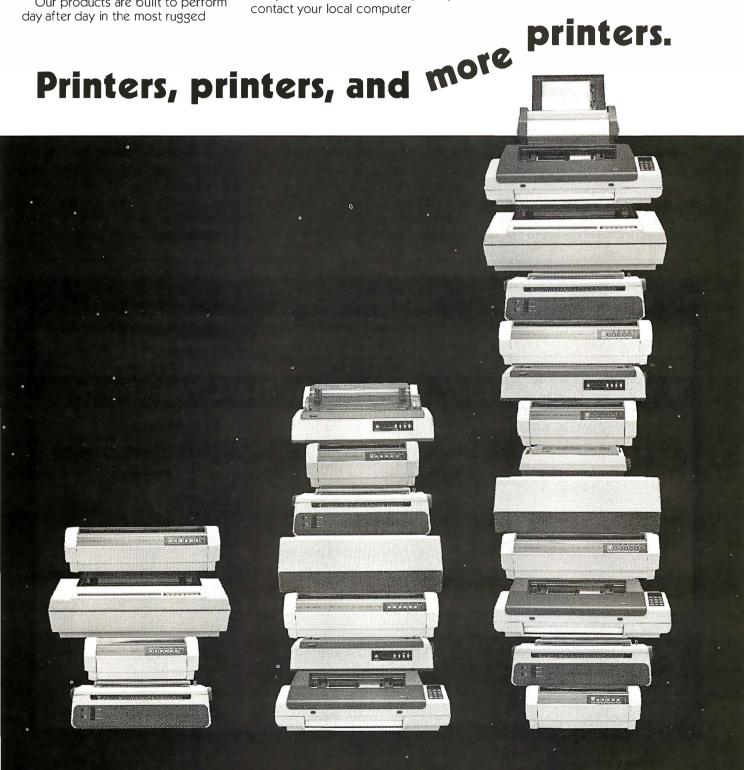
Hundreds of computer systems manufacturers choose Facit/Dataroyal products with confidence, as do a great number of Fortune 500 companies who use Facit/Dataroyal peripherals with their systems.

If you want a trouble-free printer, contact your local computer

printer dealer or Facit/Dataroyal, 235 Main Dunstable Road, P.O. Box 828, Nashua, NH 03061, (603) 883-4157.



Circle 140 on inquiry card.



both EMACS and Perfect Writer, so that if you've accidentally deleted something it's no problem; a feature we don't have in present versions of WRITE, and one I've sometimes wished I had.

I don't wish for unkill enough to pay the price, though: which is that you can't easily move text about, because the buffer is often jammed with "killed" text that refuses to stay dead. This, however, is a personal preference, and I understand that a lot of people like using the kill buffer as a text mover.

The final blow, though, is that Perfect Writer natters at me worse than Wordstar. Now it may be a function of my Televideo 950 terminal, but I don't think so. Perfect Writer keeps track of all kinds of stuff, and every time you give it a command, before it goes off to execute it, it has to tell you down on a status line what it's about to do: it also tells you what percent of your text is below the cursor, and it updates that with every keystroke so

that it flickers like a madman's dreams.

That cursor jumps around like a kangaroo, more than enough to discourage any signs of creativity in me. Of course, I'm always looking for a good excuse not to write; like most professional writers, I hate writing. (I love to have written, but that's a different matter entirely.) But I tell you, that jumping cursor is enough to drive me stark, staring mad.

It gets worse, too. Perfect Writer, like EMACS, is normally in the Insert mode: when you type text in the middle of a line, it moves everything to the right each time you type a letter, rather than overstriking the text. It says it has an "Overwrite" mode, which you can get to by going Control-x m and then writing the word overwrite. (In both WRITE and Electric Pencil, you simply toggle from Overstrike to Insert mode by doing Control-f; in WRITE, the cursor changes to show what mode vou're in.)

Perfect Writer not only makes it

darned hard to get from Overwrite to Insert mode—and I tend to use Overwrite a lot because it's very convenient for touch-typists-but in fact the Overwrite mode doesn't even work. That is, I go Control-x m overwrite and the display changes (Perfect Writer always tells you what mode you're in whether you want to know it or not; there's no way to suppress the annoying Mode Line and "Echo Line"); but although the display now tells me I'm in Overwrite mode, what happens next isn't very predictable. For one thing, backspace, which used to backspace, is now destructive, although there are places within the text where the destruction doesn't show up until later.

I don't want my keys to change their functions. I like consistency.

There are other problems. For instance, suppose you are in Insert (normal) mode, and you type a couple of extra spaces. Those spaces are now in your text. You can't see them, but they're there. And if you backspace, the cursor jumps around

#### **Skier Specials**

Franklin Ace 1000

#### \$269.00 MicroSci A-2 (Drive for Apple) 79.00 Controller.

999.00

#### **Spring Specials**

IBM Computer Interface AST-Combo Plus 64K 64K of Ram; Par. & Ser. Port; Clock w/Bat. Backup; Super Drive & Super Spooler Software ONLY \$359.00

#### VIP Pricing

8" Siemans Disk Drive FDD 100-8 (Quantity pricing available)



NEW

## FIND

#### **Drives for Apple & Franklin**

| RanaEliteI                             |     |  |   |   |   |     |   |   |   |   |   |         |
|----------------------------------------|-----|--|---|---|---|-----|---|---|---|---|---|---------|
| Rana Elite I w/cont                    | . : |  |   | • |   |     |   | e | 2 | ÷ |   | 379.00  |
| Micro Sci A-2<br>Micro Sci Controller. |     |  |   |   |   |     |   | • | • | • | * | 79.00   |
| WHEN O SELECTION OHER.                 | 4 1 |  | • |   | 2 | ė ė | • | • |   | • |   | . 73.00 |

#### Apple Products

| 7 1ppie :                   |            |
|-----------------------------|------------|
| Videx Videoterm (80 column) | . \$239.00 |
| Soft Switch                 |            |
| 16K MemoryCard              | . 59.00    |
| Par. Card & Cable           | . 59.00    |
| Grappler +                  |            |
| MicrosoftZ-80 w/cpm         | . 2\$9.00  |
| TG Joy Sticks               | . 39.00    |
| 51/4 Diskettes(10 ea.)      | . 18.95    |
| Apple Cat Modem             | . 279.00   |
| Micro Modem II              |            |
| Versa Card                  |            |
| Super Fan                   | . \$9.00   |

#### **IBM Products**

|                            | QLY. I QLY. 2 |
|----------------------------|---------------|
| Tandon TM 100-1            | \$189 \$179   |
| TandonTM 100-2             | 259 Call      |
| Tandon TM 100-4            | 349 339       |
| AST-Combo Plus64K (Qty. 1) |               |

#### **Modems**

| Hayes Smart Modem (300 Baud) | <br>    |     | \$199.00 |
|------------------------------|---------|-----|----------|
| Novation D-Cat               | <br>e e | 604 | 139.00   |

#### 8" Disk Drives

Oty 1 Oty 2

|                    |  |   |  |   |    |    |   |   | v | 7 |       | V . 7 . 2 |
|--------------------|--|---|--|---|----|----|---|---|---|---|-------|-----------|
| Siemans FDD 100-8. |  |   |  | 2 |    | ×. | × | ç |   | ŝ | \$239 | call      |
| Shugart801R        |  |   |  |   |    |    |   |   |   |   |       |           |
| Mitsubishi Dbl/Dbl |  |   |  |   |    |    |   |   |   |   |       |           |
| Qume DT-8 Dbl/Dbl  |  | 9 |  |   |    | ÷  |   |   |   |   | 479   | 469       |
| Shugart8S1R        |  | × |  |   | į. |    |   | ě |   |   | 479   | 469       |

# Computer

P.O. Box 1936, Hawthorne, CA 90250 Sales Office: 12308 Burl Avenue Hawthorne, CA 90250

360

#### Order Desk: (213) 219-0808

Customer Service: (213) 219-0811

All merchandise new. We accept MC, Visa, Check & P.O.'s from qualified firms. CA Res. add 61½% Sales Tax. Please add shipping: \$3.50 first 5 lbs., 60¢ ea. add. lb.

#### Computers

| Apple II Plus48K  |    |     |     |   |  |  |  |    |        |    |     |          |
|-------------------|----|-----|-----|---|--|--|--|----|--------|----|-----|----------|
| Franklin Ace 1000 | į, |     | . 1 | 3 |  |  |  | ĸ. | <br>٧. |    | ÷   | . 999.00 |
| Commodore64 .     |    | 508 |     | á |  |  |  |    |        | į, | . ) | Call     |

#### **Printers**

| C. loth Prowriter Par                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | .00  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| C. loth Starwriter F-10, 40PU 1349                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 00.6 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 9.00 |
| Children Control of the Control of t | 9.00 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.00 |
| Okidata 845                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 9.00 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.00 |
| NECOUEST :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 9.00 |
| Epson in Moor I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 9.00 |
| Epson MX100FT 689                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.00 |

#### **Monitors**

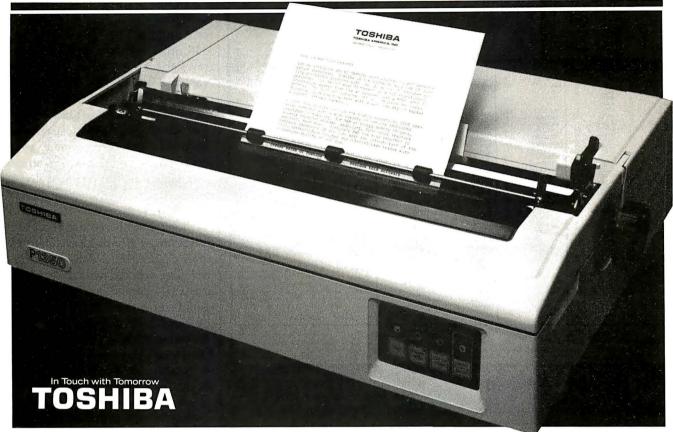
| AMDEK VIGEO 300G  | 5149.00 |
|-------------------|---------|
| AMDEK Color I     | 309.00  |
| AMDEK Color II    | 689.00  |
| AMDEK Color III   | 418.00  |
| BMC12A            | 86.00   |
| BMC 12EU (20 MHz) | 99.00   |
| Zenith(2VM121)    | 104.00  |
|                   |         |

#### **RAM (Prime Parts)**

4116 (200ns) . . \$1.15 ea. 4164 (200ns) . . \$5.90ea. 2114 (200ns) . . 1.00ea. 6116 (200ns) . . 4.99ea. 2114 (200ns) . .

> **New Expanded Hours** 8:00 to 8:00 Mon.—Sat.

# OVERBUILT.



Now you can afford to be choosy. With the Toshiba P1350 dot matrix printer. Choose quality when you want it. Speed when you need it. At a price you'd expect to pay for just one or the other.

For speed, choose the draft mode. 160 CPS. About a page a minute. For quality, choose the LetterPerfect mode. 100 CPS. About twice as fast as a daisy wheel. Or choose the graphics mode at 192 CPS.

The technological breakthrough that makes it possible: Toshiba's fine-wire, overlapping, 24-pin, impact print head. For incredibly high 180 dots per inch density with a single pass.

More choices: variable pitches of 12 CPI or 10 CPI.

Three character fonts. Variable line spacing. Single sheet paper or continuous forms, from 5" to 15" wide, with up to four copies. Friction feed, pin feed tractor or Toshiba's ultrareliable sheet feeder. And a choice of interfacing: parallel or serial.

Toshiba P1350. It gives you

the choices
you want.
The quality you
expect.
The
reliability
you need.

The precision you require. The low-maintenance long life you like. The price you love. With versatility and

GRAPHICS

performance that's been proven in more than 7,000 installations. When it

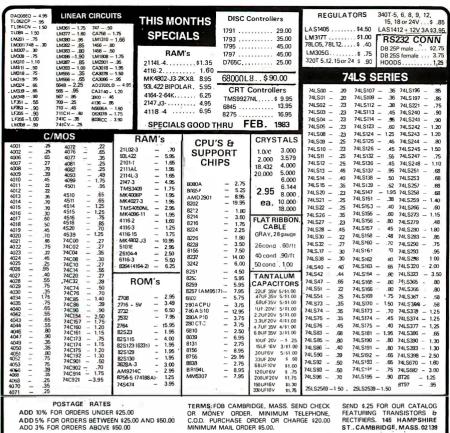
comes to printers, you really have no choice. There's only the Toshiba P1350. Write for the details on everything it can do for you. Toshiba America, Inc., Information Systems Division, 2441 Michelle Drive, Tustin, CA 92680.

Better yet, call toll-free...now!

1-800-648-5000

Ask for operator #198 In Nevada, call (702) 329-9411

# UNDERESTIMATED.



**SOLID STATE SALES** 

P.O. BOX 74B SOMERVILLE, MASS. 02143 TEL. (617) 547-7053

TOLL FREE 1-800-343-5230 FOR OFDERS ONLY

Announcing the NEW, Spring 1983 Moore Computer Forms and Supplies Catalog



Now with a NEW 34-page computer forms section!

- Our new, 84-page Spring Catalog features more than 800 quality, brand-name products-all guaranteed to meet your 100% satisfaction or your money back
- For all your computer or word processor needs. a wide selection of magnetic media, disk storage, binders, ribbons and furniture
- Over 40 pages of multi-purpose computer forms and labels at low prices, including an ALL-NEW 34-page section of imprinted forms
- Unmatched customer services, like fast order processing, custom imprinting, emergency overnight delivery, plus exclusive toll-free Technical Product Assistance

| Mail this coupon or call toll-free 1-800-323-6230 (In Illinois, Call (312) 459-0210) | ☐ <b>YES!</b> Send copy of the Sprir | d me a FREE 84-pa<br>ng 1983 Moore Ca | age, full-color<br>talog |
|--------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------|--------------------------|
| (In IIIInois, Caii (312) 459-0210)                                                   | YOUR NAME                            | TITLE                                 | BUSINESS PHONE           |
| Catalog Group MOORE                                                                  | COMPANY NAME                         | *                                     |                          |
| MOORE BUSINESS                                                                       | ADDRESS                              |                                       |                          |
| A Division of Moore Business Forms                                                   | CITY                                 | STATE                                 | ZIP                      |
| PO. Box 20<br>Wheeling, IL 60090                                                     | COMPUTER MAKE AND MO                 | DEL                                   |                          |
| Dept. 106311                                                                         | TYPE OF BUSINESS                     |                                       | NO. OF EMPLOYEES         |

with a funny monkey motion that won't go away until you've done a carriage return, or maybe killed to end of line (putting those superfluous backspace characters into the kill buffer, I suppose) . . .

In other words, I don't much care for Perfect Writer, for the same reasons I didn't like MINCE and I don't like EMACS. Yet for many of the same reasons I don't like EMACStype editors, there are those who very much do like them. Some people want character- and word-oriented commands, text movement by kill buffer, Insert as the normal mode, and all the rest.

I don't like the editor because it's distracting. Perhaps I haven't given it a fair chance, but I don't think that's true. I've worked with it-and with EMACS—enough to have a pretty good feel for that kind of editor, and my conclusion is that I have to pay too much attention to the editor, so that I don't pay enough attention to my writing. I don't want to think about my editor and its features: I want to think about the sentences I'm writing.

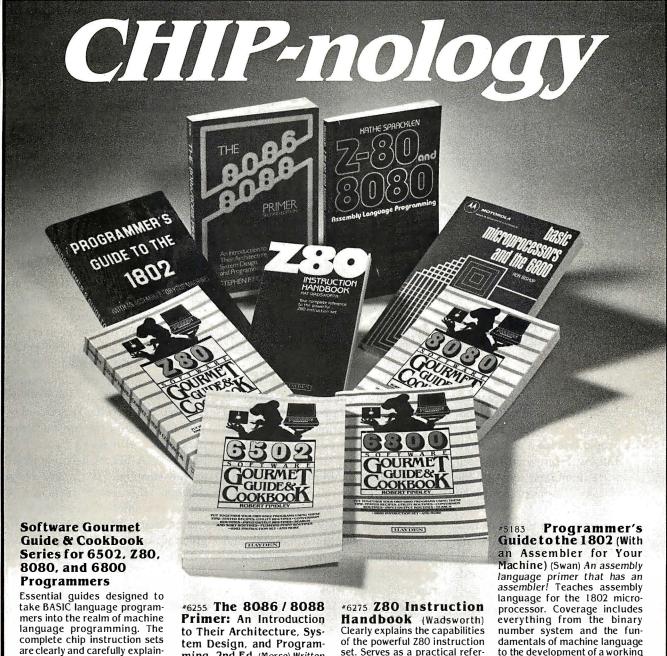
Those who'll use an editor primarily for programming, or for writing letters, might well have a different view.

There are plenty of features to Perfect Writer. It has far more commands than I have with WRITE (more than I'd ever bother to learn). It has split-screen capability, whereby you can look at and edit more than one file at a time.

It has very clear documentation. It took me almost no time to get Perfect Writer up and running on my system and get to editing a file. Now of course I know text editors in general, and I've used EMACS rather often, so perhaps that isn't surprising, but in fact the Perfect Writer documents are impressive.

There's also a spelling program that comes as an option with Perfect Writer. I haven't tried it, but it looks clean and easy to learn and I'm sure it's efficient. The documents are clearly written.

There are also lots of print-format features; I can't really compare them with WRITE (or any other editor)



are clearly and carefully explained. Descriptions of the fundamental elements of each CPU, including the program counter, index registers, stack pointer, memory, and status flags stress the creative advantages and programming power of each chip. General purpose subroutines, conversion routines, input / output processing, and floating point routines are discussed in depth.

#6276, 280 Software Gourmet Guide & Cookbook, \$15.95

#6280, 8080 Software Gourmet Guide & Cookbook, \$12.95

#6277, 6502 Software Gourmet Guide & Cookbook, \$12.95

#6281, 6800 Software Gourmet Guide & Cookbook, \$12.95 ming, 2nd Ed. (Morse) Written by the man responsible for the design of the 8086 microprocessor. Updated to provide novices and professionals alike with a thorough introduction to Intel's 8086 and 8088 microprocessors. \$11.95

#5167 Z-80 and 8080 Assembly Language Programming (Spracklen) Everything the applications programmer needs to know for Z80 and 8080 processors. Presents programming techniques with instructions. Exercises and answers included. \$10.75

set. Serves as a practical reference to industry standard mnemonics, machine code, and usage for each type of instruction provided in the Zilog Z80 CPU. A useful quide to the novice, intermediate, or professional programmer. \$5.95

\*0758 Basic Microprocessors and the 6800 (Bishop) Two books in one: a basic guide to microprocessors for the beginner, and a complete description of the M6800 system for the engineer. Problem section follows each chapter. \$16.50

#0897 The S-100 Bus Handbook (Bursky) Exclusively discusses S-100 bus computer systems and how they are organized. Covers computer fundamentals, basic electronics, and the parts of the computer. Explains all the operating details of commonly available S-100 systems. Schematic drawings of all boards discussed. Each of the major system boards is detailed as to how it operates and how it connects to the rest of the system.

1802 assembler. Simply written,

the text is intended for the

beginner, but contains informa-

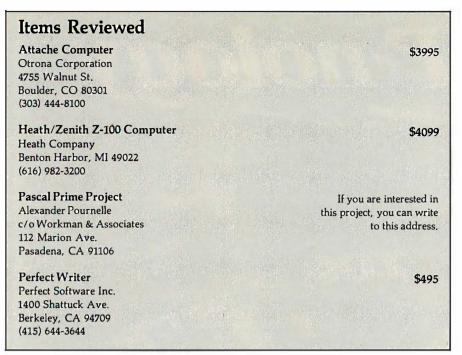
tion that experts will appreciate.

\$8.75

Available at your local computer store or

Order by Phone 1-800-631-0856 operator BY 23, In NJ call 201-843-0550, ext. 382

Havder



because I don't use those much. Most of my printing is pretty standard—60-character lines, double-spaced, identifying header, and page number; hardly a proper test for a text formatter's capabilities. From what I get out of reading the manuals, most of the text editors have some pretty fancy format capabilities.

They tell me that a number of new computer-system manufacturers are considering Perfect Writer as the text editor to provide with their hardware. They could make a worse choice.

# The Things My Postman Brings Me . . .

I mentioned last month my friend Max, who sent his CCS boards back to the factory only to be told that while the boards were in transit, CCS had changed its policy and no longer sends loaners. I've found out why: according to a source at CCS, it sold the loaner boards at a swap meet.

CCS did fix Max's machine; but it wouldn't send his boards back to him until it had his payment for repairs in its office. (His machine had only about 20 hours in operation, but because of all the delays in trying to get it running, the warranty had expired.) Eventually he got his boards, and the machine works.

Max isn't happy. He says, "The

more I thought about it, the more I became sure that I should stand up for my rights as a consumer. I called CCS one more time and asked to speak with the president of the company. According to the CCS receptionist, CCS has no president . . ."

When we got our CCS machines (for Alex and Dr. Possony), we dealt with systems consultant Colin Mick, whom I've mentioned before; and we've had no real problems. I know of many other CCS installations that run smoothly. Alas, though, Max's horror story is not the only one I've heard about what can happen if your CCS doesn't work.

And now, finally, my hate mail, typified by letters from Cherry Davis of Chicago and Ward Harold of Pennsylvania. Why, they (and others) ask, do I not learn the "spirit" of Pascal? Don't I know that "a significant teaching of the structuredprogramming movement was that the programmer should not even try to compile a program until he has convinced himself that it is free of bugs"? Obviously, I have not "given Pascal much of a chance. If you are still making trivial errors . . . you probably have not spent enough time with the language to really be comfortable with it."

Ms. Davis goes on to inform me that "you tend to confuse evaluation

of a language with evaluation of an implementation of a language . . ." She concludes that I ought to "turn over the project [Alex's Intro package] to someone who has enough experience in Pascal and with microcomputers to write a book from the ground up for teaching Pascal on microcomputers."

Meanwhile, Mr. Harold tells me that I exaggerate when I say Pascal has obscure errors and faults, because "all possible errors for an ISO, or Jensen and Wirth, standard implementation of Pascal are listed in the Pascal User Manual and Report . . ."

Yeah. They sure are. Unfortunately, there is no ISO, or Jensen and Wirth, implementation for microcomputers; furthermore, every compiler I know of tends to have pet error messages for the cases when the compiler was just plain confused; and often those messages have no relationship at all to the real error.

In fact, one of the most significant parts of my son Alex's Pascal Primer (down at UCSD it's becoming known as the survival kit) is that he goes through the error messages and shows examples of what might have caused them. Without that, I'd have given up on the language long ago.

Davis and Harold want me to consider the language separately from the implementations—but I just can't do that. Despite a lot of flack to the contrary, this is the User's Column. It has to be, because I'm no computer scientist. I use these machines, and I try to record my experiences; once in a while, those experiences may lead me to some theoretical insights, and they certainly tend to generate strong opinions: but there's no way I can evaluate Pascal-or any other language-separately from my experiences in trying to use it, which means I'm inevitably going to confuse the language with its implementation.

However: for a User's Column, that's not a bug, it's a feature. I like little computers, I've been using them for a long time, and I like talking about what you can do with the little beasts. I leave computer theory to Edsger Dijkstra and others far more qualified than I am. ■



# ryx software **Quality Discount**

# February Specials

**GUARANTEED LOWE** h any advertised price. Just show us the ad.

| HAYES SMART MODEM.                                |             |
|---------------------------------------------------|-------------|
| DOW JONES ANALYZER, reg. 629                      | NOW<br>499  |
| Artsci                                            | 670         |
| Magic Window                                      |             |
| Magic Words                                       | 56          |
| Magic Pack Combo (all above)                      | 176         |
| Beagle Bros.                                      |             |
| Oos Boss                                          |             |
| Utility City                                      |             |
| Apple Mechanic                                    | 25          |
| Broderbund                                        |             |
| Apple Panic                                       |             |
| Serpentine                                        |             |
| Charles Mann                                      |             |
| Basic Teacher                                     | \$30        |
| Teacher Plus                                      | 32          |
| Medical II                                        | 879         |
| Denver Software                                   |             |
| Easy(Exec.Attc'g) (Specia                         |             |
| Financial partner                                 | 219<br>10B  |
| Pascal Programmer                                 |             |
| Howard Software                                   |             |
| Real Estate Analyzer                              | \$145       |
| Tax preparer '82                                  | 127         |
| Tax preparer state: CA, NY/NJ/IL                  | 60          |
| Krell Co.                                         |             |
| Logo                                              |             |
| Logo w/o Frills                                   | 89          |
| Micropro                                          |             |
| WordStar (Reg. CP/M)                              |             |
| CalcStar                                          |             |
| SpeilStar                                         | 145         |
| SuperSort                                         |             |
| Data Pak (Special)                                | 329         |
| Microsoft                                         | 8045        |
| Basic Compiler<br>Cobol-80                        |             |
| Fortram-80                                        |             |
| Time Manager                                      | 125         |
| Omega                                             |             |
| Locksmith                                         | \$79        |
| Inspector                                         |             |
| Watson                                            | 44          |
| Games                                             | •••         |
| Hayden Sargon II                                  | \$25<br>32  |
| Infocom Deadline                                  |             |
| L & S Crossword Magic                             | 38          |
| Sirtech Wizardry                                  | 39          |
| Sirtech Night of Diamonds                         | 29          |
| Misc.                                             |             |
| ISM Mathemagic                                    | \$80<br>199 |
| L.IK Edit 6502                                    | 82          |
| On-Line Screen Writer II                          | 95          |
| Grandon A-stat 79                                 | 140         |
| STC Mailing list                                  | 179         |
| Visicorp Visicalc 3.3                             | 185         |
| Visicorp Vislschedule                             | 235         |
| Visicorp Adv. Visicalc (Ap.111) Visicorp Visipack |             |
| Arginith Argibank                                 | 499         |

| ST PRICES! We                                          | will           |
|--------------------------------------------------------|----------------|
| PFS: Filing Report or Graph                            | 00             |
| Muse Software                                          | 00             |
| Super Text II                                          | <b>\$</b> 125  |
| Address book                                           | 43             |
| Form letter                                            |                |
| Peachtree                                              | 52             |
| Series 40                                              |                |
| G/L, A/R, A/P ea                                       | \$399          |
| Inventory, Payroll ea                                  | . 399          |
| Series 9                                               |                |
| Peachcalc                                              |                |
| Telecommunications                                     | . 219          |
| WORDHANDLER (Special)                                  | \$140          |
| Sensible Speller                                       |                |
|                                                        |                |
| CP/M                                                   |                |
| Mark of Unicorn                                        |                |
| Final Word                                             | \$250          |
| MicroPro                                               | 0200           |
| WordStar(Special)                                      | \$250          |
| MafiMerge                                              | 95             |
| CalcStar                                               | . 199<br>. 160 |
| SuperSort 1                                            | . 170          |
| Data pack (3 in One)                                   | . 395          |
| Microsoft                                              |                |
| Basic 80                                               |                |
| Fortran 80                                             |                |
| Cobol 80                                               | 570            |
| Peachtree                                              | . 140          |
| General Ledger                                         | <b>\$</b> 399  |
| Accounts Receivables                                   | . 399          |
| Accounts Payables                                      |                |
| Inventory                                              | . 399          |
| Property Management                                    | . 799          |
| CPA Client Write-up.                                   | 799            |
| Series 8 Module<br>*Peachpak 4 (G/L, A/R, AP) (Special | 397            |
| Peachtext                                              | 350            |
| Star Computer System                                   | •              |
| G/L. A/R, A/P or Pay                                   | \$350<br>845   |
| Property Management                                    | . 845          |
| Sorcim                                                 |                |
|                                                        | \$225          |
| Trans 86                                               |                |
| Supersoft                                              |                |
| Diagnostic I                                           | \$48           |
| Diagnostic II                                          | 83             |
| Disk Doctor                                            | 84             |
| C Compiler                                             | 175            |
| Ashton · Tate                                          |                |
| D Base II                                              | \$485          |
| Byrom Software                                         |                |
| BSTAM                                                  | \$160<br>160   |
| CP Aids                                                | 100            |
| Please Call                                            |                |

| /ill m       | atch any advertised                    | pr   |
|--------------|----------------------------------------|------|
| BB           |                                        |      |
| . 88         | Digital Research                       |      |
| 125          | Pascal MT +                            |      |
| . 43         | SID (8080 Debugger)                    |      |
| . 87         | ZSID (ZBO Debugger)                    |      |
| . 52         | CP/M 2.2                               | 149  |
|              | C Basic 2                              |      |
|              | PL/1-80                                | 449  |
| 998          | Misc.                                  |      |
| 399          | Oasis "The Word Plus" \$               | 120  |
| 397          | Micro Ap Selector V                    |      |
| 270          | Lifeboat T/Maker II                    |      |
| 279<br>279   | Epic Supervyz The Boss Financial Acctg |      |
| 213          | The Boss Payroll System                |      |
|              | The Boss Time Billing                  | 090  |
| . 99         | Fox and Geller Quick Screen            | 129  |
| . 39         | Games                                  |      |
|              | Infocom Zork I, II or III              | \$32 |
|              | Deadline                               |      |
|              | Yahoo Catchum                          |      |
|              | Adventure (#1-12)                      | 99   |
| 250          | And Many More                          |      |
|              | And many more                          |      |
| 250          | IBM PC                                 |      |
| . 95         | IBM PC                                 |      |
| 199<br>160   | Micropro WordStar(Special) \$          | 250  |
| 170          | Micropro MaiiMerge (Special) S         |      |
| 395          | IUS EasiWriter II                      | 299  |
|              | IUS EasiSpeller                        | 149  |
| 205          | Microstuff Crosstalk                   | 129  |
| 325<br>325   | Alpha DataBase Manager                 | 170  |
| 345          | Alpha Mailing List                     |      |
| 570          | Compuview Vedit                        | 105  |
| 140          | Data Most Write-on                     | 110  |
|              | Woolf Move It                          | 125  |
| 399          | ISA Spellguard                         | 247  |
| 399          | Easy (Exec. Acctg. Sys.)               | 625  |
| 399          | Easy Planner                           | 145  |
| 399          | Ashton-Tate O Base II                  | 175  |
| 399<br>799   | Peachtree Accounting Module            | 399  |
| 799          | *Special Peachpak (GL, AR & AP)        | 399  |
| 485          | Ecosoft Microstat                      | 257  |
| 397          | Supersoft Optimizer                    | 160  |
| 350          | Northwest The Final Word               | 397  |
|              | _                                      | 200  |
| 350          | Games                                  |      |
| 845          | Last Colony                            | \$25 |
| 845          | Temple of Apshai.                      |      |
|              | Midway Campaign                        |      |
| 225          | Championship Blackjack                 | 34   |
| 115<br>155   | Frogger                                | 30   |
| 100          | The Warp Factor                        | 35   |
|              | Commounts of Soumars                   | Lali |
| \$48         | Accessories                            | X.   |
| . 83<br>. 84 | Accessories/                           |      |
| . 04<br>299  | Hardware                               |      |
| 175          | Boards                                 |      |
|              |                                        | 70-  |
| 485          | Co Processors 88 card (Ap. II)         | 795  |
|              | CPS Multifunction                      | 17R  |
| 100          | Mountain A/D + O/A                     | 289  |
| 160<br>160   | CCS 12K ROM/PROM                       | 89   |
| 100          | CCS A/O Converter                      | 98   |

| Har         | ess<br>dwa |     |   |     |    | S | /  |       |   |  |  |     |   |
|-------------|------------|-----|---|-----|----|---|----|-------|---|--|--|-----|---|
| Boards      | 3          |     |   |     |    |   |    |       | * |  |  | Ī   |   |
| Co Process  | ors 88 c   | ard | ( | Αı  | ٥. | I | 1) |       |   |  |  | \$7 | , |
| Softcard (Z | BO CP/I    | M A | Ď | . i | I) |   |    |       |   |  |  | 2   | 4 |
| CPS Multifu | unction    |     | Ċ |     |    |   |    | <br>Û |   |  |  | 1   | 7 |
| Mountain A  |            |     |   |     |    |   |    |       |   |  |  |     |   |
| CCS 12K R   |            |     |   |     |    |   |    |       |   |  |  |     |   |
| CCS A/O C   | nnverter   |     |   |     |    |   |    |       |   |  |  |     | ç |
|             |            |     |   |     |    |   |    |       |   |  |  |     |   |

| Applescope (your Apple as an            |        |
|-----------------------------------------|--------|
| Oscilloscope)                           | 595    |
| Videx Enhancer I                        |        |
| K & D Enhancer                          |        |
| Dan Paymar Lower case                   |        |
| ALS Smarterm                            |        |
| ALS Z-card                              |        |
| Percom Doubler II                       |        |
| Bit 3 Full Vfbw 80 (ATBOO)              | 200    |
| Bit 3 32K Memory (AT400/B00)            |        |
| BYAD DS-1 (64K, ZBO, CPM                | . 103  |
| for IBM PC)                             | EOD    |
| Datamac 64K (IBM PC)                    | 200    |
|                                         |        |
| Videx Micromodem Chip                   |        |
| Xedex Baby Blue (IBM PC)                |        |
| Ouadram Deluxe Board (IBM PC)           |        |
| Quadram 12BK Ram (IBM PC)               |        |
| Microfazer BK Printer Buffer            |        |
| Versacard                               |        |
| Bit 3 Dual Comm-plus (Apple II)         |        |
| 16K RAM WIZARD - 16 (Apple II) . Specia | al) 79 |
| Echo II Speech Synthesizer              | 159    |
| Symtec Light Pen (IBM PC)               | 140    |
| Symtec Light Pen (APII/III)             | 200    |
|                                         |        |
|                                         |        |

#### Computers Commodore/Atari/NEC/Xerox Call for Price Information

| Monitors                    |
|-----------------------------|
|                             |
| Amdek Video 300 \$160       |
| Amdek RGB Color             |
| NEC 12" Hires Green         |
| Sanyo 12" Hires Green 199   |
| TECO TM - 12 GX Green 147   |
| TECO RGB 13" 525            |
| USI Hi-RLS 12" Amber 199    |
| Zenith ZVM 12" Green 115    |
| Modems                      |
| Novation Apple-Cat II \$299 |
| Novation 212 Auto Cat       |
| Hayes Smartmodem            |
| Hayes Smart Modem 1200 520  |
| Micromodem II               |
| Hayes Chronograph           |
|                             |
| Printers                    |
| Anadex 9500 Series \$1,580  |
| Epson \$Call                |
| C. itoh Starwriter          |
| C.itoh Prowriter            |
| Diablo 630 2,200            |
| NEC 3530 1,890              |
| NEC 8023A 525               |
| Okidata Microline B2A 460   |
| Okidata Microline 83A 685   |

| Disk Drives            |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
|------------------------|----|---|---|---|----|--|---|----|---|---|---|----|-----|-----|-------|
| RANA ELITE I (AP.II)   |    |   |   |   |    |  | ( | S  | p | e | C | ia | I)  | , : | \$325 |
| RANA ELITE II          |    |   |   |   |    |  |   |    |   |   |   |    | . : | 5   | Call  |
| RANA ELITE III         |    |   |   |   |    |  |   | Ŷ. |   |   |   |    |     | 5   | Call  |
| Rana Controller (Ap. 1 |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
| Micro Sci A35 (Ap. II) |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
| Micro Sci A40 (Ap. II) |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
| Micro Sci A70          |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
| Micro Sci Controller ( |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
| TANOON TM-100-1(I      |    |   |   |   |    |  |   |    |   |   |   |    |     |     |       |
| TANOON TM-100-2(I      | Bħ | A | P | 0 | :) |  |   |    |   |   |   |    |     |     | 274   |

Prism 80 (w/ 4 options) Inc. color . . . . 1,399

Prism 132 (w/ 4 options) . . . . . . . . 1,547 Snfith-Corona TP-1

And Many More

#### ORDER TOLL FREE - Outside WI - 1-800-826-1589

Please: • Wisconsin residents - add 5% sales tax

- · Add \$3.50 for shipping per software and small items. Call regarding others.
- Foreign add 15% handling & shipping for small items & software.
- We welcome: Visa, Mastercharge (Add 4%)
  - Checks (Allow 1-2 weeks for clearing)
  - COD (Add \$1.50 per shipment)

For technical information & in Wisconsin: 715-848-2322 Store prices differ from mail order.

Oryx Software • 205 Scott St. • P.O. Box 1961 • Wausau, WI 54401

## Software Review

# LDOS Utilities

Expand the capabilities of this popular disk operating system.

Tim Daneliuk
T & R Communications Associates
4927 North Rockwell St.
Chicago, IL 60625

In this article, I'll review six utility programs that were designed specifically to run under LDOS (Logical Systems' disk operating system). FED, Filter Disk, Partitioned Data Sets, I/O Monitor, Memdisk, and Discater all enhance LDOS significantly, making it by far the best-supported DOS for the TRS-80 Models I and III. This is in part because the original authors of LDOS wrote most of the programs (FED, Filter Disk, and Partitioned Data Sets).

#### **FED**

FED (File Editor from Logical Systems Inc.) is a general-purpose file-oriented disk editor, which does not manipulate the disk at a sector or track level but rather at the file level. FED enables the advanced programmer to deal with disk files directly as

#### About the Author

Tim Daneliuk is an electrical engineer involved in research and product development for the medical electronics industry. T & R Communications Associates is a company he founded to provide technical writing and consulting services for the electronics industry.

they reside on the disk.

On entering the FED environment, you can choose between seeing a full-sector (256-byte) or a half-sector (128-byte) display. Either display is available at any time, but I prefer the half-sector display because it is more

Each utility program helps make LDOS the best-supported DOS for the TRS-80.

readable. These displays show each byte in a selected record of the disk file in both hexadecimal and ASCII (American Standard Code for Information Interchange). The displays include such information as the record number of the file being examined and the relative byte position within the file at which the cursor is pointing. The current command and any related information such as search strings are also displayed.

Once you have named the file to be edited and selected the display mode, you will have available a variety of commands. FED offers a full complement of record position controls. You may move forward or backward one record, set the display to the beginning or end of a file, or go to a specific record number within the file. Once the record has been found, you can position the cursor over the specific byte and modify it by typing over the existing value with either hexadecimal or ASCII data. You can also have the program search for a specific hexadecimal or ASCII string, thereby enabling you to find one or more occurrences of a particular string in the file.

FED also has provision for explicitly dealing with the *load module format* found in LDOS-executable (/CMD) files. You may locate and calculate a hexadecimal load address and go to the next load block in a file. You can also convert a user-specified word in the file to its binary representation. Finally, FED has several printer-related commands: an entire file may be dumped to the printer, a top-of-form command may be sent to the printer, or just the contents of the screen edit buffer may be sent to the printer.

#### At a Glance

#### Name

FFD

#### Type

General-purpose file-oriented editor

#### Manufacturer

Logical Systems Inc. 11520 North Port Washington Rd. Mequon, WI 53092 (414) 241-3066

#### Price

\$40

#### **Format**

51/4-inch floppy disk

#### Language

Z80 machine language

TRS-80 Models I or III running under LDOS

#### Audlence

LDOS owners

FED will be popular with the assembly-language programmer who wishes to make minor modifications to an assembled file. FED is efficient and user-friendly.

#### Filter Disk

Though LDOS comes with several useful I/O (input/output) path filters, these do not even begin to fully exploit LDOS. The Filter Disk package (from Logical Systems Inc.) provides you with 14 filters and, as an added bonus, assembly-language source code.

The most impressive filter is XLATE/FLT, which is a complete translation filter system and can be used for both input and output filtering. With XLATE, you can translate any or all of the ASCII characters to any other code by building a translation table using either the LDOS BUILD command or a word processor capable of generating ASCII files. You can enter the translation table values as hexadecimal numbers (e.g., 1F = 2D) or as literal characters (e.g., W=r). You can also specify whether the translation in the I/O path is to take place during output. input, or both. You could, for example, write a translation filter that converts the ASCII character set to the BCD (binary-coded decimal) codes used in an IBM Selectric typewriter.

Logical Systems included two tables with this filter. One performs a translation from ASCII to the EBCDIC (extended binary-coded decimal interchange code) used in many mainframe computers. You might use this filter on the communications line to enable a TRS-80 using the LDOS LCOMM communications program to access a mainframe computer. The second translation table implements the Dvorak keyboard on the TRS-80 instead of the common OWERTY.

Several filters are included that are useful for printing or listing data and programs. LISTBAS/FLT formats a BASIC program, so that each statement within a multistatement line is indented and listed separately. This will give you a better idea of program structure. STRIP7/FLT removes the high bit from each character, a feature that is useful in listing files created by some editors that use the high bit for control information. This changes all characters outside the normal ASCII range into ASCII characters. STRIPCNT/FLT removes all control characters in an I/O path. One application of STRIPCNT/FLT is in listing word-processor files on the video screen. By eliminating the control characters, the program makes the file more readable.

With TITLE/FLT you can place a title at the top of each page in a printed program listing. You may optionally have a time and date appended to the title. You can convert all lowercase characters to uppercase and vice versa with UPPER/FLT and LOWER/FLT. You could convert uppercase text files to lowercase and use a word-processor program to manually capitalize the beginning of sentences, proper nouns, etc. SLASH0/ FLT will be popular with owners of daisy-wheel printers because it issues a backspace and slash (/) after every zero character to distinguish it from the letter O. Daisy-wheel users will also find PAGEPAWS/FLT useful: it causes the printer to pause at the end of each printed page to allow a new sheet of paper to be inserted. Though

#### At a Glance

#### Name

Filter Disk

A set of 14 I/O software filters to supplement those included with LDOS

#### Manufacturer

Logical Systems Inc. 11520 North Port Washington Rd. Meguon, WI 53092 14141 241-3066

#### Price

\$60

#### **Format**

51/4-inch floppy disk

#### Language

Z80 machine language (source code included)

#### Computer

TRS-80 Models I and III running under LDOS

#### Audlence

LDOS owners

incorporated in the printer filter provided with LDOS, a separate linefeed filter, LINEFEED/FLT, is also included on the filter disk to add or remove a linefeed after a carriage return. The filter on the disk occupies less memory, an advantage for those who do not need all the features the printer filter offers.

The remaining four filters serve a variety of purposes. MONITOR/FLT will change every control character in its I/O path to an alphanumeric symbol, and every character above hexadecimal 7F to an up-arrow (or leftbracket on some printers) character. MONITOR/FLT is similar to STRIPCNT/FLT except that MONITOR/FLT indicates which control characters are being sent to a particular device. The TRAP/FLT filter can prevent any one character from being sent through an I/O path. You might use this filter while listing disk files to trap a character that causes a dot-matrix printer to change font sizes. Similarly, REMOVE/CMD will remove all occurrences of a particular byte in a disk file. Finally, the keyboard filter CALC/FLT will do hexadecimal/ decimal/binary conversion and hexadecimal arithmetic while you are us-

#### At a Glance

#### Name

Partitioned Data Sets

#### Type

A file-management system that reduces the amount of disk space required for storage

#### Manufacturer

Misosys POB 4848 Alexandria, VA 22303-0848 (703) 960-2998

#### Price

\$40 plus shipping

#### **Format**

51/4-inch floppy disk

#### Language

Z80 machine language

#### Computer

TRS-80 Models I and III running under LDOS

#### Audience

LDOS owners

ing another program. I incorporated this filter into my normal LDOS operation and find it particularly useful when writing assembly-language programs. It permits me to do the necessary base conversions and arithmetic right from the editor-assembler environment!

It is no great surprise that the Filter Disk is an excellent piece of software since it comes from the manufacturer of LDOS. The documentation is thorough, and the filters very usable.

#### Partitioned Data Sets

Partitioned Data Sets (PDS, from Misosys) is an interesting add-on filemanagement package for LDOS. The basic idea for PDS comes from minicomputer operating systems in which many small programs or data files are stored together in one disk file. The entire file is called a library, and each program or data set in the library is called a member. If each member were saved as a separate file, a lot of disk space would be wasted because the DOS has a minimum file size of 1 granule (1.25K bytes on a Model I and 1.5K bytes on a Model III). By combining small programs into one library, you can conserve disk space.

With the implementation of PDS in LDOS systems, two types of files can be library members: executable (/CMD) or data files. The type of executable file PDS will accept is limited, however. First, a /CMD file must be in the proper LDOS load module format. If it is not, PDS will store it as usual, but when you try to execute that member, PDS will think it's a data file and generate the error message Load Module Format Error. The PDS manual mentions this problem but does not go into any real depth on fixing it. For this reason, PDS really should be regarded as a program for the more sophisticated user.

Another limitation of PDS is that LDOS filter programs that are stored in a library cannot be used. They must be copied from the PDS to a regular stand-alone filter file in order to be used in a FILTER command line. Similarly, data files are accessible only after they have been copied from the PDS into a standard LDOS data file

PDS offers a great deal of versatility not normally found in microcomputer file management.

Despite these limitations, PDS is a very useful program. Its three main functions are to permit available disk space to be used more efficiently by combining files into a library, to simplify the process of making archival backups of crucial data, and to simplify and unclutter the disk directory by having files that are related stored in one PDS library. For example, I created a PDS library that contains my assembly-language development tools: an editor-assembler and two disassembler programs. They are all accessible to me as usual (all are /CMD-type files), and by putting them into one library, I freed up 1.5K bytes of disk space!

#### At a Glance

#### Name

I/O Monitor

#### Type

A program designed to intercept disk error messages and allow user-selected recovery options

#### Manufacturer

Logical Systems Inc. 11520 North Port Washington Rd. Mequon, WI 53092 (414) 241-3066

#### Price

\$25

#### Format

51/4-inch floppy disk

#### Language

**Z**80 machine language

#### Computer

TRS-80 Models I and III running under LDOS

#### Audience

LDOS owners

The PDS program is itself a partitioned data set with eight members, which constitute the necessary programs to create and maintain PDS structures under LDOS. The BUILD command is used to create new partitioned data sets. Once this is done, members are added using the APPEND command. It is possible to determine what files are in the PDS and whether they are data or /CMD by using the DIR command. The LIST command enables you to list any individual member in a PDS library in either hexadecimal or ASCII. The KILL command leaves the member in the PDS but makes it unavailable for access. The COPY command transfers a PDS member to a regular LDOS /CMD or data file. The RESTORE command is used with files that have been killed to make them available again, while PURGE is used to actually remove killed members and reclaim the disk space.

PDS offers a great deal of versatility not normally found in microcomputer file management. The thorough documentation and features of PDS make it useful for most intermediate and advanced TRS-80 programmers.

#### At a Glance

#### Name

Memdisk

Creates a pseudodisk in memory that can be used like a physical floppy-disk drive

#### Manufacturer

Logical Systems Inc. 11520 North Port Washington Rd. Meauon, WI 53092 (414) 241-3066

#### Price

\$39

51/4-inch floppy disk

#### Language

Z80 machine language

#### Computer

TRS-80 Models I and III running under **LDOS** 

#### Audience

LDOS owners

#### I/O Monitor

This program (from Logical Systems Inc.) is an error monitor designed to intercept errors generated during disk read or write operations. Normally when these kinds of errors occur, the screen displays an LDOS error message, and the program currently running aborts. With I/O Monitor installed, the error is intercepted, and you are notified as usual. Then you are given four choices: abort the program, continue the program, ignore the error, or retry the disk operation that forced the error. In this way, you have some chance of recovering from the error, or at least minimizing the damage done.

This program will find particular favor with owners of the TRS-80 Model I expansion interface. The disk controller is notorious for I/O errors, and I/O Monitor will make handling these errors much simpler and efficient

#### Memdisk

The program Memdisk (from Logical Systems Inc.) sets up a pseudodisk drive in the TRS-80 memory. That part of memory is then treated like a physical floppy-disk drive, and the normal LDOS library commands can be used to access the "memdisk." This capability offers two advantages: first, it provides an extra disk drive to back up and copy files from one nonsystem disk to another. Second, because the memdisk is in memory, disk accesses to this drive are very fast. Consequently, certain kinds of programs can be substantially speeded up by putting their files on a memdisk. An ISAM (indexed sequential-access method) sorting routine could be made faster by putting its index file on a memdisk where it could be sorted much more

When the Memdisk program is first enabled, you may specify how many sectors per granule to use and how many RAM (random-access read/ write memory) "tracks" this memdisk is to have. If insufficient memory is available for the desired memdisk configuration, an error message appears, and the procedure is aborted. Otherwise, the memory to be used for

> I use Memdisk to simplify the day-to-day DOS "housekeeping" chores.

the memdisk is verified with a short memory-checking utility, and control is returned to LDOS when this is finished. Thereafter, the memdisk appears to the system as a normal disk drive. The memdisk may be disabled at any time so that the memory it uses is returned to the system for general DOS use.

I use this program regularly to simplify the day-to-day DOS "housekeeping" chores. The documentation is good, and the program well designed.

#### Discater

Discater (from Softerware) is a general-purpose disk-cataloging program for LDOS. After loading the program into the TRS-80, you insert the disks to be cataloged one at a time

#### At a Glance

#### Name

Discater

#### Type

A general-purpose diskcataloging program

#### Manufacturer

Softerware 16007 Miami Way Pacific Palisades, CA 90272 (213) 459-3414

#### Price

\$39.95

#### **Format**

51/4-inch floppy disk

#### Language

Z80 machine language

#### Computer

TRS-80 Models I and III running under LDOS

#### Audience

LDOS owners

into the disk drive so their directories can be read. (The program also works with single-drive systems.) Once the catalog is compiled, you can elect to have the entire catalog listed on screen or sent to a printer. You can also search for a particular file to see on which disks it appears.

Discater is a useful program, but it has one deficiency: the documentation is rather sparse. This is not as severe a drawback as it might seem, however, because the program is menu-driven and self-prompting. In general, the program runs well, and I've found it to be a handy tool for locating files on my many disks.

#### Conclusion

Tandy has recently announced that LDOS will become Radio Shack's official programmer's DOS, as opposed to TRSDOS, which is the user's DOS. Radio Shack stores and computer centers may now display and sell LDOS, which will increase the already considerable popularity of this operating system. With the addition of the six utility programs reviewed here, you can substantially increase the usefulness of LDOS.

# **Book Reviews**

#### 68000 Assembly Language Programming

Gerry Kane, Doug Hawkins, and Lance Leventhal Osborne/McGraw-Hill Berkeley, CA, 1981 577 pages, softcover \$16.99

Reviewed by Paul E. Hoffman 2109 Shattuck Ave. Berkeley, CA 94704

As a programming manual, 68000 Assembly Language Programming does an admirable job of teaching the basics of assembly language through the use of extremely clear charts and numerous examples. The book also presents a solid background in many of the computer concepts related to assembly-language programming.

With new 16-bit microcomputers appearing every month, it's important to have a manual that completely covers all aspects of programming the 68000. This book is one of the most complete assembly-language manuals available for any chip, and it's written so that a person experienced with other assembly languages can quickly grasp all the concepts unique to the 68000.

While many assembly-language manuals present a few program fragments used in conjunction with descriptions of specific operations, these authors decided to teach the language through complete programs. Because assembler directives are important to most assembly-language programming, the programs listed contain generalized directives. The authors teach the programming of the 68000 as a concrete skill, not an academic exercise.

After an overview of general assembly-language programming, the manual presents the principles of assemblers and provides examples of the common assembler directives. The book then jumps to the 68000 operations set. The set is divided into the categories of frequently, occasionally, and rarely used operations, so the beginner needn't think about too many different codes at a time. This separation makes the operations easier for the novice to learn and for the experienced programmer to remember.

The discussion of addressing modes is much more understandable in this book than in most others, and the drawings accompanying the text are excellent. Learning the concepts of the 68000's addressing modes is especially important for those of us who are more familiar with 8-bit processors. If you don't have a complete grasp of the addressing modes, you'll find it almost impossible to comprehend the concepts of programming in assembly language.

The manual provides over 50 programming examples. The requisite arithmetic manipulations are given, but also included are many examples of character- and string-handling programs. A chapter on handling lists and tables, which the 68000 does quite easily, is another excellent feature.

For the advanced programmer, chapters on parameter passing, subroutines, interrupts, and exceptions prove to be a useful resource. The manual also has a unique feature for assembly-language programmers—a long chapter on interfacing the 68000 with the 6821 peripheral interface adapter. (Most authors have a voided this discussion because of its highly technical nature.) The procedure is

clearly explained, and most programmers, even those with out I/O (input/output) programming experience, should be able to understand it.

The rest of the manual deals with the art of programming in general. The two chapters on problem definition and program design do not deal with assembly language at all, but the chapters on debugging, testing, and maintenance give clear examples and helpful hints for programming with the 68000. The chapter on documentation is outstanding and should be required

reading for all assembly-language programmers. The manual also includes the usual appendixes and a full index.

Unfortunately, the authors did not explore the many differences and similarities between the 68000 and other common chips. Nevertheless, they have presented a complete and well-written manual for the 68000, one that will remain useful for the life of the chip. The manual is quite helpful for the experienced assembly-language programmer and basic enough for the novice.

# **BYTE's Bits**

#### Customs Service to Seize Bogus Apples

The U. S. Customs Service has warned international travelers that counterfeit Apple II computers and related materials violating recorded copyrights or trademarks of Apple Computer Inc. are subject to seizure if brought into this country. Custom agents have seized illegal copies of Apple computers and software entering the U. S. through several West Coast locations and Honolulu.

Customs officials note that suspect machines are identical in size and appearance to genuine Apples, are normally tan in color, and bear such names as Apple II, Orange, Apollo II, Golden, PET TK 1000, and AP II. Some of these units have no brand name, and foreign values of these machines vary from \$100 to \$450.

Only two overseas subsidiaries of Apple Computer are authorized to produce and sell Apple manuals and software: Apple Computer International of Singapore and Apple Computer Ltd. of the Republic of Ireland.

## Ti Computer Courses Earn College Credit

The American Council on Education has granted college credit recognition to eight computer training courses offered by the Texas Instruments Education and Development Center, Texas Instruments employees and customers can now earn from 1 to 3 semester hours of college credit while taking one of four software courses: Introduction to TI Pascal, Advanced TI Pascal. Database Management System, and TI Assembly Langauge, In addition, four courses on computer maintenance are available to Texas Instruments staff members for college credit.

For further information, contact Texas Instruments Inc., Education and Development Center, Attn: Registrar, M/S 2220, POB 2909, Austin. TX 78769.■

## **Technical Forum**

# The Magic of the Monte Carlo Method

Roger C. Millikan 5475 Toltec Dr. Santa Barbara, CA 93111

The Monte Carlo method is a mathematical technique that uses sequences of random numbers to solve problems that might not be solvable otherwise. It is wellsuited to microcomputers, especially because most language systems provide a random-number-generating function. Monte Carlo programs tend to be short and simple, yet they provide powerful tools for solving what would otherwise be difficult problems. In this article I will illustrate how the method works by using it to solve two different types of problems.

The first problem involves simulating a physical process with random behavior built into it. For example, consider the diffusion of neutrons through a solid. A given neutron moves in a straight line until it collides with an atom. Then it is deflected at some random angle and proceeds on to the next collision. The result is a zigzag path of random motions. This can easily be simulated by the Monte Carlo method. Applications such as this are fundamental to the design of atomic reactors.

The Monte Carlo method also offers a way to find the area of odd-shaped regions or the volume of odd-shaped solids. It is in this type of problem that the method seems truly magical. You start with random and unpredictable sets of numbers but soon arrive at a definite answer. This is possible because a collection of random processes may have some average behavior that is constant. Consider flipping a coin 10,000 times. If you flip it once more, no one can predict for certain whether it will come down heads or tails. But you can predict with confidence that approximately 5000 of the previous flips turned up heads. With the Monte Carlo method, you make use of the average behavior of your random numbers to provide the desired, definite result. Of course, averages are subject to some statistical fluctuation, hence the result is only approximate. But by using more and more random-number trials, you can make the Monte Carlo result more and more accurate. This is where the speed of computers becomes important. A microcomputer can go through a simple looping calculation 10,000 times without exhausting your patience. Nevertheless, you should keep in mind that Monte Carlo calculations give only approximate answers.

#### The Drunk and the Lamppost

The neutron problem I mentioned earlier has an interesting analogy. Picture a drunk man clinging to a lamppost for support. He decides to head for home and lurches off in a random direction. After staggering some number of steps (no more than 10, for he is quite far gone), a dizzy spell causes him to spin around and head off in a different direction. After 10 of these staggers, the poor fellow collapses to the pavement to sleep it off. (Figure 1 shows several possible paths of the drunk.) Now let's ask a curious question. On the average, how far from the lamppost is the drunk when he collapses?

This question can be answered easily by running a Monte Carlo simulation of the drunk's walk on a microcomputer. After each simulation, we record the distance of the drunk from the lamppost. Averaging the results for 1000 simulations gives a fair approximation for the

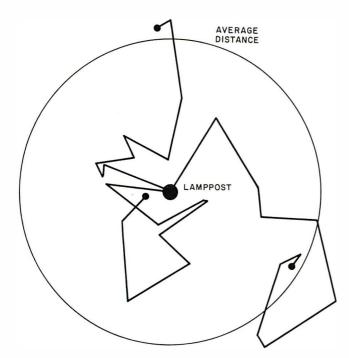


Figure 1: Paths traveled by three drunks upon leaving a lamppost (central spot). Each staggers and lurches 10 times, ending at the location marked by the filled circle at the end of his path. The large circle marks the average radial distance such drunks would travel as calculated by the Monte Carlo program of listing 1.

answer. Listing 1 shows a program in Microsoft BASIC that simulates 1000 drunken walks, each with 10 lurches, and averages the 1000 results. The circle in figure 1 shows the average distance from the lamppost as computed by the program.

Few people care how far the average drunk staggers from a lamppost, but many care how far neutrons travel in radiation shields, and the two are essentially the same problem. At first it may have seemed difficult to solve, but we have seen that the Monte Carlo method makes it easy. This example also exhibits a characteristic that many Monte Carlo programs share: they have a simple loop that is traversed many times. And because there is no need to store many intermediate results, memory requirements are fairly small.

#### Finding Areas and Volumes

The second type of Monte Carlo problem is well illustrated by the following example. Suppose we want to find the area under the curve  $y = x^2$  when x varies from 0 to 1. This is the shaded area of figure 2. If you know integral calculus, you can find the exact answer at once. It is  $\frac{1}{3}$ . But if you don't know calculus, the problem is extremely difficult.

The Monte Carlo approach to this problem is akin to throwing darts randomly at the boxed-in area of figure 2. Then we count the number of darts that land in the shaded area (under the curve  $y = x^2$ ) and divide this number by the total number of darts thrown. This gives us an approximation of the area under the curve. The more darts thrown, the better the approximation.

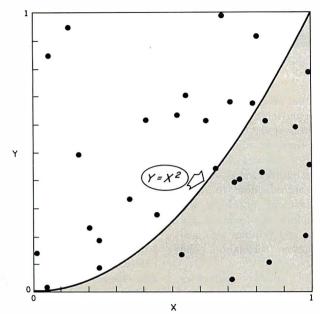
**Listing 1:** The Staggering Drunk problem. This BASIC program uses the Monte Carlo method to calculate the average distance from the lamppost that a drunk will traverse before collapsing, after 10 lurches in random directions.

```
1000 REM Monte Carlo demonstration
1010 D1 = 0
1015 N = 1000
1020 FOR J = 1 TO N
 X = 0: Y = 0
1030
1040
 FOR K = 1 TO 10
1050
 GOSUB 2000
1060
 NEXT K
1070
 D1 = D1 + SQR((X * X) + (Y * Y))
1080
 NEXT J
1090 PRINT "Avg radial distance is"; D1/N
1100 STOP
2000 REM
2010 REM Subroutine gives new x, y with
 random direction and distance
2020 REM
2030 REM
 (0 to 10) from old x,y
2040 REM
2050 R = 10 * RND(R)
2060 T = 2 * 3.14159 * RND(T)
2070 X = X + (R * COS(T))
2080 Y = Y + (R * SIN(T))
2090 RETURN
```

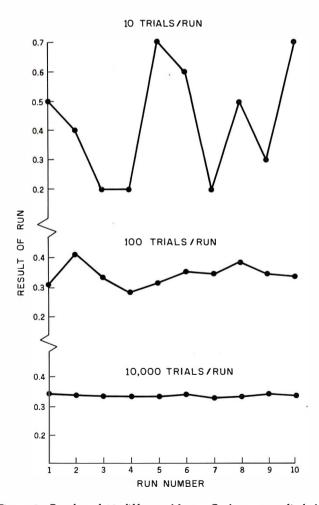
The BASIC program shown in listing 2 follows this procedure, except that, instead of throwing darts, the program uses calls to the random-number generator to provide the x,y coordinates for the dart locations. In figure 2, black dots show the locations for 30 points generated in one run of the program. The approximate result for the area in this run was 0.37.

As I mentioned before, Monte Carlo results become more accurate as the number of trials increases. This is shown dramatically in figure 3, which shows the results of several runs of the program in listing 2 using varying numbers of darts or trials. When only 10 trials per run are used, the results for each run vary wildly. But for 10,000 trials per run, the results are reproducible to within 1 percent. Herein lies the major drawback of the Monte Carlo method. For each extra digit of precision in your result, you must do 100 times as many trials. Thus to get a result that has 100 times the accuracy of the result shown for 10,000 trials, we would need 1 billion trials. Even though computers are fast, running through a loop that many times could take weeks. This relationship between the number of trials and the statistical fluctuation of the results thus limits the precision of the Monte Carlo method.

Given this problem, why should anyone be interested in the Monte Carlo method? First, it is generally easy to apply, no matter how complex the problem of interest. The problem may not exhibit as simple a curve as  $y = x^2$ . Indeed, the curve may be so complicated that even the methods of integral calculus fail. Yet the same short Monte Carlo program can approximate the desired



**Figure 2:** Plot of 30 random x,y points giving a Monte Carlo approximation of the area under the curve  $y=x^2$  in the unit square. The area (A) can be estimated as points under the curve divided by total points. In this instance  $A=\frac{11}{30}=0.37$ . The true result is 0.333.



**Figure 3:** Results of 10 different Monte Carlo runs to find the shaded area of figure 2 showing the statistical fluctuation for three different numbers of trials per run. The exact result is 0.333.

**Listing 2:** A BASIC program to calculate the area under a curve. In this case the curve is the function  $y = x^2$ . The program uses the Monte Carlo method with a varying number of tries, from 10 to 10,000. At the bottom of the listing is a sample of the output from the program.

```
1000 DEF FNA(X) = X * X
1010 N
 = 10
 : GOSUB 2000
1020 N = 100
 : GOSUB 2000
1030 N = 1000 : GOSUB 2000
1040 N = 10000: GOSUB 2000
1050 STOP
2000 REM Monte Carlo integration
2010 REM
 subroutine. "N" is the
2020 REM
 number of points to try.
2030 REM
 FNA(x) is the defined
2040 REM
 function y = x * x.
2050 REM
2060 U = 0
2070 FOR I = 1 TO N
2080
 X = RND(X): Y = RND(Y)
2090
 IF Y \leftarrow FNA(X) THEN U = U + 1
2100
 NEXT I
2110 PRINT "For"; N; "tries,"
2115 PRINT " the integral is"; U/N
2120 RETURN
3000 END
Output:
For 10 tries,
 the integral is .4
For 100 tries,
 the integral is .35
For 1000 tries,
 the integral is .341
For 10000 tries,
 the integral is .3415
```

result. Second, the Monte Carlo method can be extended to three- and higher-dimensional cases with ease. Last, the accuracy and memory of microcomputers are well matched to the natural accuracy and memory requirements of the Monte Carlo method.

Looking toward the future, I see an exciting prospect: Monte Carlo programs have a natural parallelism that might be implemented on clusters of microcomputer chips. This could reduce, in some cases, the excessive amount of time needed for precise results. For example, in a problem where random x, y, and z coordinates are needed for two particles, 1 and 2, we might have six 1-chip computers generating all these random numbers in parallel. For more particles, we could plug in more chips. On a sequential machine, the time requirements for problems with many particles tend to explode. The Monte Carlo method and its natural parallelism offers a possible way around this. Perhaps we can look forward to systems where you plug in a new processor for each new particle or dimension in a problem.

# **Book Reviews**

#### A Practical Introduction to Computer Graphics

Ian O. Angell Halstead Press New York, 1981 146 pages softcover, \$16.95

Reviewed by John B. Harrell III Quarters 192-A PTSMH Naval Shipyard Portsmouth, NH 03801

In the few short years that microcomputers have been around, many books have been written about computer graphics. Unfortunately, most of them have focused on game applications or specific computers. A Practical Introduction to Computer Graphics by Ian Angell takes a different approach. In addition to addressing the various aspects of computer graphics, the author offers insight into the theory and mathematics behind their creation.

As its title implies, the book is a primer on methods of creating computer graphics. The text is accompanied by examples of graphics routines that you can easily alter to suit your needs. Angell also provides the basic information you'll need to generate such complex graphics structures as detailed machine patterns, various data presentations, and diagrams.

The book has twelve chap-

امسا

ters that progress in a logical order and increase in difficulty in terms of the concepts and the examples they present. The first chapter includes such useful information as an informal introduction to two-dimensional graphics and definitions of some of the terms and routines you will encounter throughout the book.

The author addresses graphics by way of an introduction to the mathematics of two-dimensional geometry, and his presentation is logical and easy to understand. Still, you must be somewhat familiar with the mathematical precepts he presents; the detailed derivation found in a typical mathematics text, for example, is omitted. The pre-

cepts are essential because they form a basis for the underlying theory that Angell delineates throughout the remainder of the book. He uses cleverly designed examples to develop and reinforce each precept.

Angell explains each of the two-dimensional space transformations—translation, change of scale, and rotation—clearly and concisely. In addition, he develops the matrix representation necessary to achieve each transformation. He also gives you a method that combines transformations by multiplying transform matrixes.

After discussing the tools for producing complex graphics structures, he explains how you can clip a graphics picture

# Marymae industries, inc. '

In Texas Orders Questions & Answers 1-713-392-0747

22511 Katy Freeway Katy (Houston) Texas 77450 To Order 1-800-231-3680 800-231-3681

### SAVE BIG DOLLARS ON ALL TRS-80° HARDWARE & SOFTWARE

TRS-80° BY RADIO SHACK. Brand new in cartons delivered. Save state sales tax. Texas residents add only 5% sales tax. Open Mon.-Fri. 9-6, Sat. 9-5. We pay freight and insurance. Come by and see us. Call us for a reference in or near your city. Ref: Farmers State Bank, Brookshire, Texas.

# WE OFFER ON REQUEST

Federal Express (Overnight Delivery)

Houston Intercontinental
Airport Delivery (Same Day)

U.P.S. BLUE (Every Day)

References from people who have bought computers from us probably in your city

® TRS-80 is a Registered Trademark of Tandy Corp

ED McMANUS





In stock TRS-80 Model

No Tax on Out of Texas Shipments!

Save 10% 15%

OR MORE

Reserve Your Model 16 Today

Telex 77-4132 (Fleks Hou)

#### WE ALWAYS OFFER

- ✓ NO extra charge for Master Card or Visa.
- We use Direct Freight Lines. No long waits.
- ✓ We always pay the freight and insurance
- ✓ Toll free order number
- Our capability to go to the giant TRS-80° Computer warehouse 5 hours away, in Ft. Worth, Texas, to keep you in stock.

JOE McMANUS



to fit within the boundaries of a physical device. He also describes how to cover a certain area of the graphic surface to allow for the addition of text or other information without interference from the graphic pattern.

Another chapter introduces the reader to coordinate geometry in three-dimensional space. Here, too, Angell makes a point to introduce new mathematical concepts as warranted to explain the principles involved.

The concepts of coordinate transformation are explained through a discussion of threedimensional geometry. Once the author establishes these transformations for threedimensional space, he explains how to create orthographic projections of three-dimensional objects onto a twodimensional viewing surface.

Angell also includes a discussion of perspective and stereoscopic views. The orthographic projection of an object in three-dimensional space does not reflect realworld perspective, in which all parallel lines seem to meet on the visual horizon. Stereoscopic views, on the other hand, account for the slight differences in perspective seen by the right and left eyes.

One of the book's most interesting sections concerns the development of hidden line removal algorithms. The author calls the examples he uses "wire figures." The function of hidden line removal algorithms is to make these wire figures resemble solid objects by removing the lines that would not normally be visible.

The remainder of the book focuses on the procedures you

would need to produce complex graphic structures, frameby-frame animation for computer movies, and other more ambitious projects.

In general, A Practical Introduction to Computer Graphics is both well written and well conceived. The graphics examples, which are explicit and well documented, could easily be integrated into a sophisticated graphics package. The book is also an excellent refresher in the mathematics that graphics projects require.

This review would be incomplete, however, without mention of the serious flaws that detract from the book's usefulness. To begin with, the graphics examples are in FORTRAN-IV. In addition, the author has used the Calcomp graphics package. which has limited use among microcomputer users.

FORTRAN-IV clearly restricts the use of the graphics examples to the small number of microcomputer users who have access to a FORTRAN compiler. Even if you converted the FORTRAN source text to BASIC or Pascal, the lack of access to generalized plotting routines used in the examples would require a considerable amount of programming.

Having worked with the graphics capabilities of a highresolution system like Techtronics 4052, I fully appreciate the flexibility that the Calcomp plotting routines offer. Unfortunately, only a few high-resolution graphics systems offer such flexibility, so the excellent examples in this book will probably remain untested by many readers.■

# General Software

Mailing Address: 1454 S. 25th St. Terre Haute, IN 47803

VISA and MASTERCHARGE

**TOLL FREE - Outside Indiana** 1-800-457-0517 **ORDER DESKS** (812) 234-9421

Best Selection

Best Service Write for our famous CATALOG. Contains many items not in ad. Still only \$1.00 (refund with pur-chase) Outside US add \$10 plus Air Parcel Postage. Add \$3.50 postage and handling per each Item. Indiana residents add 4% sales tax. Allow 2 weeks on checks. COD add \$3.00 per item. Prices subject to change without notice. All items subject to availability.

Disk Manual Only Manual ARTIFICIAL INTELLIGENCE Dental (PAS-3) Medical (PAS-3 \$849/40 ASHTON-TATE dBASEII BALCONES The Boss Fin Acc System \$1750 BYROM SOFTWARE

| COMPUTER CONTROL      |             |
|-----------------------|-------------|
| *Fabs(B-Tree)         | \$159/35    |
| Ultrasoft             | \$150/35    |
| CONDOR COMPUTER       | . \$ 133/33 |
| CONDON COMPOTEN       | 05.5155     |
| Condor II             | . \$515/55  |
| Condor II             | . \$795/55  |
| DIGITAL RESEARCH      |             |
| CP/M                  |             |
| 2.2 Intel MDS-800     | \$1/9/35    |
|                       |             |
| Northstar (Horizon)   |             |
| Micropolis            |             |
| TRS Model II          | . \$159/45  |
| CB-80                 | .\$429/45   |
| PL 1-80               | \$429/50    |
| CBasic2               |             |
| EDIO COMPLITED        | . \$ 90/30  |
| EPIC COMPUTER         |             |
| *Super vyz            | .\$ 89/25   |
| FAIRCOM               |             |
| *Micro B+             |             |
| (Specify language)    | \$229/30    |
| FINANCIAL PLANNING    | . 4220700   |
| *Mini Model           | C400/50     |
|                       | . \$429/50  |
| FRIENDS               |             |
| ACCESS 801            | . \$249/50  |
| ACCESS 80 II          | \$429/50    |
| FRONTIER SOFTWARE     |             |
| Professional          |             |
| Time Accounting       | @E 40/E0    |
|                       |             |
| General Subroutine    |             |
| Application Utilities | . \$439/50  |
| ISA                   |             |
| Spellguard            | \$229/30    |
| SP/Law                | \$109       |
| PASCAL LANGUAGE       | .ψ103       |
| Passal7               | 6040440     |
| Pascal Z              | . \$349/40  |
| Pascal MI + V5.5      | .\$429/40   |
| Compiler              | . \$316/25  |
| SPP Only              | .\$165/15   |
| KEY BITS              |             |
| Wordsearch            | \$179/50    |
| String 80             | \$ 84/25    |
| String 80 (Source)    | C2140 Q     |
| String 80 (Source)    | . \$2/9     |
| UNICORN               |             |
| Final Word            | . \$255     |
| LEXISOFT              |             |
| *Spellbinder          | \$349/55    |
| MICRO AP              | . \$5 10,00 |
| Selector IV           | 6240140     |
|                       |             |
| Selector V            | . \$449/50  |
| SBasic                | . \$269/40  |
| MICRO TAX             |             |
| *Level I              | .\$249      |
| *Level II             | \$995       |
| 2010111               | . 4000      |

| *Level III *Combo I!+ III                                                                                               | \$1495                                                         |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| MICRO PRO® Wordstar                                                                                                     | . \$295/60                                                     |
| Basic-80. Basic Compiler Fortran-80 Cobol-80 M-Sort Macro-80 Edit-80 MuSimp/muMath MuLisp-80 NORTHWEST ANALYTICAL       | .\$329<br>.\$349<br>.\$629<br>.\$124<br>.\$144<br>.\$ 84       |
| 'Statpak                                                                                                                | .\$409/45                                                      |
| *"The Word"ORGANIC SOFTWARE                                                                                             | .\$ 75                                                         |
| *Textwriter III                                                                                                         | . \$269/25<br>. \$269/30                                       |
| General Ledger Accounts Receivable Accounts Payable Payroll Inventory Mailing Address for P8 Version Series 6-Peachtree | . \$399/60<br>. \$399/60<br>. \$399/60<br>399/60<br>. \$399/60 |
| CPA                                                                                                                     | . \$799/60                                                     |
| Sales Tracker AR-Sales Analysis Inventory Order Entry REDDING GROUP                                                     | \$1299/60<br>. \$799/40                                        |
| Lynx                                                                                                                    | . \$199/25                                                     |
| *Pascai/M Z80                                                                                                           | . \$449/40                                                     |
| *Act 86/88                                                                                                              | . \$149/25                                                     |

| *Trans 86 *Supercalc SOUTHERN COMPUTERS                            | .\$119/25<br>.\$269 |
|--------------------------------------------------------------------|---------------------|
| SOUTHERN COMPUTERS                                                 |                     |
| Call for our unbeatably low prices STRUCTURED SYSTEMS GROU         | JP                  |
| GL, AR, AP, PR, OE                                                 | . \$849/50          |
| Call for others                                                    |                     |
| SUPERSOFT                                                          | C 04/00             |
| *Diagnostic II                                                     | \$149/30            |
| *SSS Fortran                                                       | .\$219/30           |
| *Fortran w/RATFOR                                                  | . \$289/35          |
| *C Compiler                                                        | . \$175/20          |
| *Tiny Pascal *Disk Doctor                                          | \$ 84/20            |
| *Term I                                                            | .\$129/25           |
| Term II                                                            | . \$169/25          |
| Z8000 Xassembler                                                   | . \$449/35          |
| Games & Others less 10% WHITESMITHS                                |                     |
| C Compiler                                                         | \$700/40            |
| Pascal (incl C) IBM PERSONAL COMPUTER                              | . \$900/45          |
| IBM PERSONAL COMPUTER                                              |                     |
| Wordstar 3.2                                                       | .\$309/60           |
| Mailmerge                                                          |                     |
| Visicalc (256K)                                                    | \$229/NA            |
| Optimizer                                                          | \$200/NA            |
| Supersoft C - CP/M86                                               | \$500/NA            |
| Peachtree<br>3 Pak GL, AP, AR                                      | \$505               |
| Final Word                                                         |                     |
| Condor I. II, III                                                  |                     |
| Statpak                                                            |                     |
| BSTAM                                                              |                     |
| Fasy Writer II                                                     | \$315               |
| Easy Speller.<br>Easy Filer (dBase mgr.)                           | .\$155              |
| Easy Filer (dBase mgr.)                                            | .\$335              |
| Spellbinder                                                        | . \$355/49          |
| Word Handler II                                                    | .\$155/49           |
| Broderbund Software                                                |                     |
| General Ledger (w/ A/P)                                            | \$435               |
| Payroll                                                            | . \$155             |
| Mfg. Inventory and Control Progra                                  | ım                  |
| T1990, 300 Meg. storage requir<br>Distributed in Cobol object code | ed                  |
| Call for Info\$2                                                   |                     |
| Write for catalog (\$1.00) and other                               | listings            |
| 31.                                                                |                     |

· Available for Apple with Softcard





#### 64K Ram

780 KB Disk Storage
Word Processing, Ultracalc CP/M
C-Basic Software
Smith Corona TP 1
Letter Quality Printer

#### \$2995.00 Retail Value \$4895.00

EAGLE 1600... CALL



| TEL  | E   | ١ | v | , | ŧ | C | 0 | ı | E |   | ) | • | T | - | E | • | F | 7 | ı | ١ | 1 | I | ı | N  | 1 | 4 | L  | . 8 | 3 |
|------|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|---|----|-----|---|
| 910. |     |   |   |   |   |   |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   | \$ | 5 | 7 | 9. | 0   | C |
| 912C | ٠,  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | \$ | 6 | 9 | 9. | 0   | C |
| 920C | - 9 |   |   |   |   |   |   |   |   |   |   |   | ٠ |   |   |   | ٠ |   |   |   |   |   |   | \$ | 7 | 4 | 9. | 0   | C |
| 925C |     |   |   |   |   | × |   |   |   |   |   | × |   |   |   |   |   |   |   |   |   |   |   | \$ | 7 | 4 | 9. | 0   | 0 |
| 950  |     |   |   |   |   |   |   |   |   |   | * |   | ٠ |   |   |   |   |   |   |   |   |   |   | \$ | 9 | 5 | 0. | 0   | C |
|      | _   | _ | _ | _ | _ |   | _ |   |   |   |   |   |   | _ |   |   |   | _ |   |   |   |   |   |    | _ | _ |    | _   | _ |

| 950\$950.00         |
|---------------------|
| TELEVIOEO COMPUTERS |
| 800A \$1319.00      |
| 802\$2649.00        |
| 802H\$4695.00       |
| 806\$5495.00        |
| 816\$9495.00        |
| 803CALL             |
| 17.5                |

#### MONITORS

#### AMOEK

| 100 B & W \$74.95                       |
|-----------------------------------------|
| 300G                                    |
| 300A\$179.00                            |
| Color I                                 |
| Color II\$699.00                        |
| Color II A                              |
| Color III                               |
| Color IV, CALL                          |
|                                         |
| BMC                                     |
| 12" Green\$79.99                        |
| 13" Color 1401 (Mid Res.) \$369.00      |
| 9191U 13"\$329.00                       |
| ZENITH                                  |
| 7\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ |
| ZVM 121\$99.00                          |
| SHARP                                   |
| Sharp 13" Color TV \$275.00             |
| PANASONIC                               |
| TR-120MIP (High Res. Green) \$159.00    |

CT-160 Dual Mode Color ..... \$299.00

#### HEWLETT PACKARD

**柳** 410V

\$209



| HF41C\$149.00     |
|-------------------|
| HP 10C \$69.00    |
| HP 11C \$79.00    |
| HP 12C\$1 14.00   |
| HP 15C\$109.00    |
| NEW 16C. \$114.00 |

#### PERIPHERALS

| HP41 Card Reader \$144.00        |
|----------------------------------|
| HPIL Module\$99.00               |
| HPIL Cassette \$449.00           |
| HPIL Printer \$419.00            |
| Quad Memory Module \$64.00       |
| Time Module\$64.00               |
| Extended Function Module \$64.00 |



| 8001A |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | ×  | × | \$729.00 |
|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|----------|
| 8031  |   |   |   | · |   |   |   | × |   |   |   |   |   | ÷ |   |   |    |   | \$729.00 |
| 8012  |   |   |   |   |   |   | ٠ |   |   |   |   |   |   |   |   | ٠ | Ġ. |   | \$549.00 |
|       | F | ) | F | 3 | ı | r | V | 1 | 1 | _ | E | Ξ | , | 7 | 1 | E | 3  |   |          |

| 8023\$499.00        |
|---------------------|
| 7710/7730\$2399.00  |
| 3510/3530 \$1599.00 |
| MONITORS            |

| MONITORS |  |  |  |  |  |  |  |   |  |  |  |  |  |  |   |   |          |
|----------|--|--|--|--|--|--|--|---|--|--|--|--|--|--|---|---|----------|
| JB-1260  |  |  |  |  |  |  |  |   |  |  |  |  |  |  | , |   | \$129.00 |
| JB-1201  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |   |   | \$159.00 |
| JC-1201  |  |  |  |  |  |  |  | ٠ |  |  |  |  |  |  |   | × | \$319.00 |
| JC-1203  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |   |   | \$729.00 |

# TIMEX SINCLAIR

1603 ...... CALL

| 16K Memory Module         | \$44.95 |
|---------------------------|---------|
| Vu-Calc                   | \$17.95 |
| Super Math                | \$12.95 |
| Check Book Manager        | \$13.95 |
| The Organizer             | \$14.95 |
| The Budgeter              | \$13.95 |
| Stock Option              | \$14.95 |
| Loan & Mortgage Amortizer | \$12.95 |



#### PC-1500 POCKET COMPUTER \$209



Cass. Interface Unit... \$172.00 CE 152 Cass. Recorder... \$69.00 CE 155 8K Ram Expansion Module.... \$94.00



#### 

80 Column Printer......\$649.00



#### 3550PRINTER...\$2099

#### PERCOM ORIVES

| 5¼" 160K   | Disk | Drive |              | \$249.00 |
|------------|------|-------|--------------|----------|
| 51.4" 320K | Disk | Drive | - 22 22 2722 | \$299.00 |

#### AMOEK

| 3 10 A Amber Monitor \$ 179.00 |
|--------------------------------|
| 310G \$179.00                  |
| Amdisk (314" Drive) \$729.00   |
| DXY Plotter \$759.00           |
| Color II \$699.00              |
|                                |

#### BOFTWARE

| I.U.S. Easywriter II \$249.0     | 0 |
|----------------------------------|---|
| I.U.S. Easyspeller \$129.0       | 0 |
| Peach Package (GL/AP/AR) \$419.0 | O |

#### PROFESSIONAL SOFTWARE

IBM/PC Word Processing..., \$319.00

#### PRINTERS

#### **SMITH CORONA**

## TP 1 .......\$599.00

| Starwriter(F10-40CPS) \$1399.00      |
|--------------------------------------|
| Printmaster(F10-55CPS) \$1749.00     |
| Prowriter 80 Col.(Parallel) \$499.00 |
| Prowriter 80 Col.(Serial) \$629.00   |
| Prowriter 2 (132 Col.) \$799.00      |

#### OKIDATA

| 82A           |  |  |  |    |  |  | ŝ |   |    | \$ | 4 | 2 | 9. | 0 | C |
|---------------|--|--|--|----|--|--|---|---|----|----|---|---|----|---|---|
| 83A           |  |  |  |    |  |  |   |   |    | \$ | 6 | 5 | 9. | 0 | C |
| 84 (Parallel) |  |  |  |    |  |  |   |   | \$ | 1  | 0 | 7 | 9. | 0 | C |
| 84 (Serial)   |  |  |  | ** |  |  |   | × | \$ | 1  | 1 | 9 | 9. | 0 | C |

#### 108

| MicroPrism \$649.00             |
|---------------------------------|
| WIICTOF 115111 3045.00          |
| 132 (Fully Configured)\$1599.00 |
| 80 (Fully Configured) \$1399.00 |
| Call for other configurations.  |

#### STAD

| Gemini | 10 |  |  |  |  |  |  |  |  |  | \$37 | 9. | .0 |
|--------|----|--|--|--|--|--|--|--|--|--|------|----|----|
|        |    |  |  |  |  |  |  |  |  |  |      |    |    |

#### 

|     | OIABLO |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |  |  |         |        |
|-----|--------|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|---|--|--|---------|--------|
| 620 |        |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |  |  | \$<br>1 | 179.00 |
| 630 |        |  |  |  |  |  |  |  |  |  |  |  |  | v |  |  | v |  |  | \$<br>1 | 849.00 |

#### MODEMS

#### HAYES

| Smart\$239.00                      |
|------------------------------------|
| Smart 1200 (1200 Baud) \$549.00    |
| Chronograph\$199.00                |
| Micromodem II (with Term) \$309.00 |
| Micromodem 100\$309.00             |
|                                    |

#### NOVATION

| Cat\$144.00                        |
|------------------------------------|
| D-Cat\$159.00                      |
| 212 Auto Cat \$589.00              |
| Apple Cat II \$279.00              |
| 212 Apple Cat II \$609.00          |
| CALL for Price and Availability on |
| New NOVATION Cat 103, 103/212      |
| and J-Cat.                         |
|                                    |

#### ANCHOR

| Mark I (RS-232)             | \$79.00   |
|-----------------------------|-----------|
| Mark II (Atari)             | 79.00     |
| Mark III (TI-99)            | 109.00    |
| Mark IV (CBM/PET)           | \$125.00  |
| Mark V (OSBORNE)            | . \$95.00 |
| Mark VI (IBM-PC)            | \$179.00  |
| Mark VII (Auto Answer Call) | \$119.00  |
| TRS -80 Color Computer      | \$99.00   |
| 9 Volt Power Supply         | \$9.00    |
|                             |           |

## Cx commodore

| 8032                        | \$1039.00 |
|-----------------------------|-----------|
| CBM 64                      | CALL      |
| 4032                        | \$749.00  |
| 8096 Upgrade Kit            | \$369.00  |
| Super Pet                   | \$1499.00 |
| 2031                        | \$469.00  |
| 8250 Dbl.Sided Disk Drive . | \$1699.00 |
| D9060 5 Meg. Hard Disk      | \$2399.00 |
| D90607.5 Meg. Hard Disk.    | \$2699.00 |
| 8050                        | \$1299.00 |
| 4040                        | \$969.00  |
| 8300 (Letter Quality)       | \$1549.00 |
| 8023                        | \$599.00  |
| 4022                        | \$399.00  |
| NewZ-Ram,AddsCP/M & 64H     | ×\$549.00 |
| The Manager                 | \$209.00  |
| Magis                       | CALL      |
| Word Pro 5 Plus             | \$319.00  |
| Word Pro 4 Plus             | \$299.00  |
| Word Pro 3 Plus             | \$199.00  |
| The Administrator           | \$379.00  |
| Info Pro Plus               | \$219.00  |
| Power                       |           |
| CBM 8032 Dust Cover         |           |
| CBM 8050/4040 Dust Cove     | er\$10.99 |
|                             |           |

### computer mail order east

800-233-8950

IN PA. CALL (717)327-9575, 477 E.THIRO ST., WILLIAMSPORT, PA. 17701

In stockitems shipped same day you call. No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the continental United States with no waiting period for certified checks or money orders. Add 3% (minimum \$3.00) shipping and handling on all C.O.D. and Credit Card orders. NV and PA residents add sales tax. All items subject to availability and price change. NOTE: We stock manufacturer's and third party software for most all computers on the market! CALL TODAY FOR OUR NEW CATALOGUE.





ACE 1000 ACE 10 with Controller Card ACE Writer Word Processor

#### CALL...

FOR SYSTEM PRICE! ACE 1200..... CALL

#### VIBICORP

for Apple, IBM & Franklin

| Visidex                                     |
|---------------------------------------------|
| Visifile\$189.00                            |
| Visiplot \$159.00                           |
| Visiterm                                    |
| Visitrend/Plot\$229.00                      |
| VisiSchedule\$229.00                        |
| Desktop Plan \$189.00                       |
| Visicalo(Apple Ii ,Atari,CBM,IBM). \$179.00 |
| Visicorp prices for IBM may vary slightly.  |

#### CONTINENTAL

| Home Accnt. (Apple/Franklin)\$59.00     |
|-----------------------------------------|
| Home Accountant (IBM) \$119.00          |
| 1st Class Mail (Apple/Franklin) \$59.00 |

#### SIRIUS

| Free Fall  |  |  |  |   |  |   |  |  |  |  | \$24.00 |
|------------|--|--|--|---|--|---|--|--|--|--|---------|
| Beer Run   |  |  |  |   |  |   |  |  |  |  | \$24.00 |
| Snake Byte |  |  |  |   |  |   |  |  |  |  | \$24.00 |
| Space Eggs |  |  |  |   |  |   |  |  |  |  | \$24.00 |
| Sneakers   |  |  |  |   |  |   |  |  |  |  | \$24.00 |
| Bandits    |  |  |  | ٠ |  | ٠ |  |  |  |  | \$28.00 |
|            |  |  |  |   |  |   |  |  |  |  |         |

#### BRODERBUND

| Apple Panic    |  |  |  |  |  |  |  | \$23 | .00 |
|----------------|--|--|--|--|--|--|--|------|-----|
| David's Magic  |  |  |  |  |  |  |  | \$27 | .00 |
| Star Blazer    |  |  |  |  |  |  |  | \$25 | .00 |
| Arcade Machine |  |  |  |  |  |  |  | \$34 | .00 |
| Choplifter     |  |  |  |  |  |  |  | \$27 | .00 |
| Serpentine     |  |  |  |  |  |  |  | \$27 | .00 |

#### INFOCOM

| Deadline       | ŀ |  |  |  |  |  |  |  |  |  | \$35.00 |
|----------------|---|--|--|--|--|--|--|--|--|--|---------|
| Star Cross     |   |  |  |  |  |  |  |  |  |  | \$29.00 |
| Zork I         |   |  |  |  |  |  |  |  |  |  | \$29.00 |
| Zork II or III |   |  |  |  |  |  |  |  |  |  | \$29.00 |
|                |   |  |  |  |  |  |  |  |  |  |         |

#### MPC

Bubdisk (128K Ram)........ \$719.00

#### AXLON

Ram Disk (Apple/Franklin) . . . . . CALL

Call for Price on

#### **VIC 64**

Peripherals and Software.

PROFESSIONAL SOFTWARE

Word Processing for VIC 64 . . . . \$79.95

#### DISK DRIVES FOR ATARI

| T 88-S1\$399.00    |      |
|--------------------|------|
| T 88-A1\$289.00    |      |
| RFD40-S1 \$539.00  |      |
| RFD 40-A1 \$329.00 |      |
| RFD 40-S2\$869.00  | 4110 |
| RFD 44-S1\$659.00  |      |
| DED 44 00 6000 00  |      |

#### **RANA DISK ORIVES**

Call for price and availability on the new Rana Disk Drives for The Apple and Franklin Computer Systems.

## *U***-SCI**



#### MICRO-8CI DISK ORIVES FOR APPLE & FRANKLIN

| A2             | \$299.00 |
|----------------|----------|
| A40            | \$349.00 |
| A70            | \$459.00 |
| C2 Controller  | \$79.00  |
| C47 Controller | \$89.00  |
|                |          |

#### FLOPPY DISKS

#### MAXELL

| MD I (Box of 10)   | \$32.00 |
|--------------------|---------|
| M D II (Box of 10) | \$44.00 |
| FD I (8")          | \$40.00 |
| FD II (8" DD)      | \$50.00 |

| 514" SS DD. | <br> |  |  |  |  |  |  |  | \$26.00 |
|-------------|------|--|--|--|--|--|--|--|---------|
| 514" DS DD  | <br> |  |  |  |  |  |  |  | \$36.00 |

#### **ELEPHANT**

5/4" SS SD.....\$19.99

#### **VIC 20**

\$179.



| VIC 20 Dust Cover\$9.99                |
|----------------------------------------|
| VIC 1530 Datassette\$69.00             |
| VIC 1540 Disk Drive \$339.00           |
| VIC 1541 (64K Disk Drive) CALL         |
| VIC 1525 Graphic Printer \$339.00      |
| VIC 1210 3K Mem. Exp\$32.00            |
| VIC 1110 8K Mem. Exp\$53.00            |
| VIC 1111 16K Mem. Exp, \$94.00         |
| VIC 1011 RS232CTerm. Interface \$43.00 |
| VIC 1112 IEEE-488 Interface \$86.00    |
| VIC 1211 Super Expander \$53.00        |
| VIC Mother Board\$99.00                |

# **ATARI**\*

#### 400

| 16K | . \$199 |
|-----|---------|
| 32K | \$274*  |
| 48K | \$359*  |

\*Non-Atari Ram

| 410 Recorder\$74.00            |
|--------------------------------|
| 810 Disk Drive \$429.00        |
| 822 Printer \$269.00           |
| 825 Printer                    |
| 830 Modem                      |
| 820 Printer \$259.00           |
| 850 Interface \$169.00         |
| CX40 Joy Sticks (pair) \$18.00 |
| CX853 Atari 16K Ram \$77.95    |

#### HOMECOMPUTERS



48K ..... \$499 New low price effective January 1, 1983.

#### Call for Price and Availability of the NEW 64K ATARI 1200

| Axlon Ramdisk (128K) \$429.95       |
|-------------------------------------|
| Intec 48K Board \$159.00            |
| Intec 32K Board                     |
| One Year Extended Warranty \$70.00  |
| CX481 Entertainer Package \$69.00   |
| CX482 Educator Package \$130.00     |
| CX483 Programmer Package \$54.00    |
| CX484 Communicator Package \$344.00 |

#### **SOFTWARE FOR ATARI**

#### ATARI

| Pac-Man\$33.00          |
|-------------------------|
| Centipede\$33.00        |
| Caverns of Mars         |
| Asteroids\$29.00        |
| Missile Command \$29.00 |
| Star Raiders            |
| Galaxian \$33.00        |
| Defender\$33.00         |

| ON-LINE                         |
|---------------------------------|
| Jawbreaker \$27.00              |
| Softporn \$27.00                |
| Wizard and the Princess \$29.00 |
| The Next Step                   |
| Mission Asteroid \$22.00        |
| Mouskattack\$31.00              |
| Frogger                         |
| Cross Fire (ROM) \$36.00        |
|                                 |

| BYNAPSE                    |
|----------------------------|
| File Manager 800 + \$69.00 |
| Chicken                    |
| Dodge Racer\$26.00         |
| Synassembler\$30.00        |
| Page 6                     |
| Shamus \$26.00             |
| Protector\$26.00           |
| Nautilus\$26.00            |
| Slime\$26.00               |
| Disk Manager \$24.00       |
|                            |

#### DATABOFT

| Pacific Coast Highway \$25.00 |
|-------------------------------|
| Canyon Climber\$25.00         |
| Tumble Bugs\$25.00            |
| Shooting Arcade \$25.00       |
| Clowns and Balloons\$25.00    |
| Graphic Master \$30.00        |
| Graphic Generator \$13.00     |
| Micro Painter \$25.00         |
| Text Wizard \$79.00           |
| Spell Wizard \$64.00          |
| Bishop's Square \$25.00       |
| Sands of Egypt\$25.00         |
|                               |

#### APX

|                   |     | _ |    |    |    |   |         |
|-------------------|-----|---|----|----|----|---|---------|
| Text Formatter    |     |   |    |    |    |   | \$18.50 |
| Family Budgeter   |     |   |    |    |    |   | \$18.50 |
| Eastern Front     |     |   |    | ٠. |    |   | \$24.00 |
| Family Cash       |     |   |    | ٠. |    |   | \$18.50 |
| Jukebox           |     |   |    |    |    |   | \$13.00 |
| Downhill          |     |   |    |    |    |   | \$18.50 |
| Outlaw            |     |   |    |    |    |   | \$18.50 |
| Holy Grail        |     |   |    |    |    |   | \$24.00 |
| Player Piano      |     |   | ٠. |    | ٠. |   | \$18.50 |
| Keyboard Piano    |     |   |    |    |    |   | \$18.50 |
| Number Blast      |     |   |    |    |    |   | \$13.00 |
| Frogmaster        |     |   |    | ٠. |    |   | \$18.50 |
| 747 Land Simulato | or. |   | ٠. |    |    | : | \$18.50 |
| Word Processor    |     |   |    |    |    |   | \$40.00 |
|                   |     |   |    |    |    |   |         |

#### **EPYX**

| rush, Crumble & Chomp \$24.00   |
|---------------------------------|
| rypt of the Undead\$24.00       |
| curse of Ra \$16.00             |
| Dates tones & Ryn\$16.00        |
| nvasion Orion\$19.00            |
| King Arthur's Heir\$24.00       |
| Morloc's Tower\$16.00           |
| tescue a t Rige1\$24.00         |
| Ricochet                        |
| tar Warrior \$29.00             |
| emple of Asphai\$29.00          |
| Ipper Reaches of Apshai \$16.00 |

#### CBS

| K-razy Shoot Out | \$32.00 |
|------------------|---------|
| K-razy Kritters  | \$32.00 |
| K-razy Antics    | \$32.00 |
| K-star Patrol    | \$32.00 |



STICK STAND \$6.99

Arcade Action from your ATARI or VIC Joy Stick

computer mail order west

IN NV. CALL (702)588-5654, P.O. BOX 6689, STATELINE, NV. 89449

INTERNATIONAL ORDERS: All shipments outside continental United States must be pre-paid by certified check only! Include 3%(minimum \$3.00) shipping and handling. EDUCATIONAL DIBCOUNTS: Additional discounts are available from both Computer Mail Order locations to qualified Educational Institutions

# **System Notes**

# A High-Resolution Analog-to-Digital Converter for the TRS-80

James Cameron POB 742 Port Aransas, TX 78373

Interfacing the typical 8-bit microcomputer with the real world often involves the conversion of constantly varying (analog) signals to digital form through some sort of converter and I/O (input/output) circuitry. ADCs (analog-to-digital converters) can be based on readily available 8-bit converter ICs (integrated circuits), such as National Semiconductor's MM5357.

An 8-bit converter IC is an easy and natural match for the 8-bit data bus and the 8-bit architecture of most common microcomputers. However, you'll quickly discover that 8-bit resolution is quite coarse. If you're interested in applications requiring a wide measurement range, or in accuracy better than  $\pm 0.5$  percent, the 12-bit ADC interface described in this article and the principles that allow extension of the interface to 14- and 16-bit converters may be what you've been looking for.

The resolution or ability to distinguish digitally between slightly different signals is determined by the number of bits in the conversion. For example, an 8-bit binary scale can be used to count to 256 (0 through 255, actually), or to divide a measurement scale into 256 equal parts. Let's say you were making a Fahrenheit thermometer to read in the range of -44 to +212 degrees. An 8-bit converter would give you an output in 1-degree increments,  $\pm \frac{1}{2}$  degree of accuracy—there is  $\pm \frac{1}{2}$  bit uncertainty in any 8-bit conversion. This is acceptable for

some applications, but to obtain a reading in tenths of a degree, at least 12-bit resolution (which divides the scale into 4096 intervals, or about 1/16-degree intervals) is needed. Of course, it's impossible to simultaneously read 12 bits onto an 8-bit data bus. The trick is to make the 12-bit conversion, hold the data, read the low bits first, then the high bits, and put them together with software. All this, plus some status, over-range, and polarity information can be obtained with the 12-bit Datel/Intersil ICL7109 ADC and four other common ICs.

#### The Circuit

Figure 1 on page 380 shows the complete interface circuit for a Radio Shack TRS-80 Model I in block diagram form. The ADC is connected to the data bus through an input port and an output port, both of which are enabled by the  $\overline{\text{IN}}$  and  $\overline{\text{OUT}}$  lines and an address decoder. The output port is used to control the flow of data and information onto the data bus via the input port. Two latches are used: one configured as the output port with address 1, and the other as the input port with address 0. The three least significant address lines (A0 through A2) are decoded by a 3-to-8 line decoder to select the port. The selected lines are activated by gating the  $\overline{\text{IN}}$  and  $\overline{\text{OUT}}$  signals from the TRS-80. The  $\overline{\text{IN}}$  and  $\overline{\text{OUT}}$  are NANDed so that if either goes low, the decoder's active-

# Marcey Inc.

# The METEOR

A System designed for Maximum Reliability, Flexibility and Value

#### **System Specifications:**

Processor.

- 4 MHz Z-80A CPU
   64K Memory Bank Selected
   2 Serial & 2 Parallel I/O Ports
- 2K or 4K Shadowed Monitor EPROM
   Double Density Floppy Disk Controller
- Single Board Construction
   Meets IEEE 696 Specifications

**Power** 

• Constant Voltage Power Supply (Provides Brown-Out Protection)

- **Specifications:** Switchable 110/220V & 50/60 Hz Operation
- +8V/30A +-16V/3A

Chassis

- 1 Slot Shielded Motherboard (11 Free Slots in Single User System)
- Specifications: Dual Double-Sided Double-Density Disk Drives Black Chassis with Gold Anodized Front Panel
- 2.2 Megabytes Total Disk Storage

Operating **Systems:** 

- CP/M Version 2.2 Standard (Included)
- Enhanced Command Control Processor

**Available Options:** (Additional Cost)

- 4 Thin-Line Floppy Disk Drives (5 Megabyte Floppy Disk Storage)
- MP/M Multi-User Operating System
   Turbo-DOS Multi-User Operating System
  - Custom Wood Cabinet
- Turbo-DOS Multi-Processor Operating System

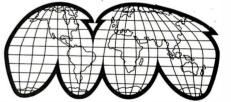
• Slave Processors for Multi-Processor Systems

List Price \$4995

# **Introductory Price \$3495**

For Further Information Please Circle Reader Service Card 522

# MARCEY Universal S-100 Mainframe



The first S-100 Mainframe that is truly UNIVERSAL.

The power supply is SWITCHABLE between 110/220v and 50/60Hz, and provides BROWN-OUT PROTECTION with its Constant Voltage Transformer.

Available in either 12-slot or 22-slot configurations

**Specifications:** 

- Motherboard S-100/IEEE-696 Shielded and Grounded
- Power Supply +- 8V @ 30A +- 16V @ 2A
- Constant Voltage Power Transformer
- Switchable 110/220V & 50/60Hz

12 Slot

List \$795.00

**Introductory Price \$575.00 Introductory Price \$675.00** 

22 Slot

List \$995.00

For Further Information Please Circle Reader Service Card 523

Distributors of Computers and Computer Products

6700 Valjean Avenue □ Van Nuys, California 91406 □ (213) 994-7734

Dealer Inquiries Invited Quantity Pricing Available

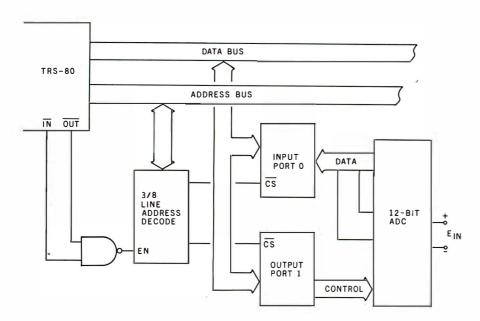
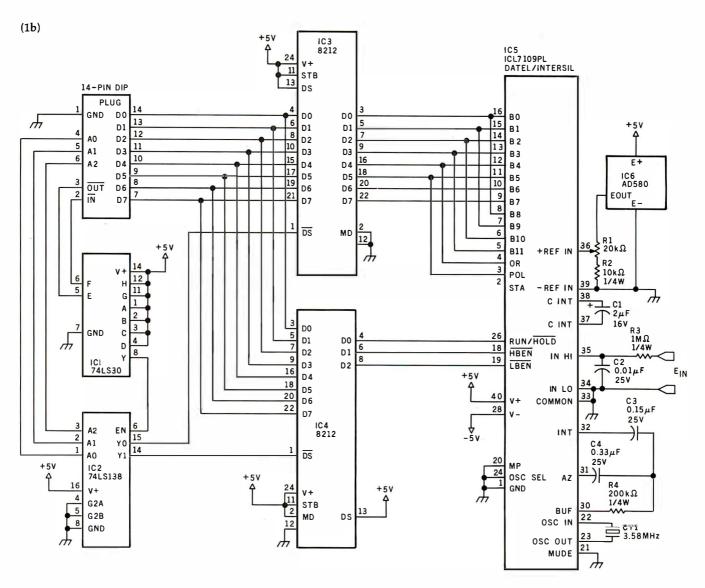


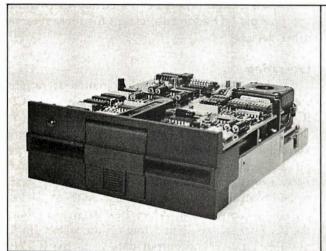
Figure 1: Diagrams of the complete interface circuit. In figure 1a, a block diagram of the circuit shows how the I/O port address is decoded and how the eight data lines are partitioned into an input bus and into an output bus. Figure 1b is a schematic diagram developed from figure 1a. Note that all eight data lines are used when transferring data to the computer and only three lines are used by the computer to control the ADC.

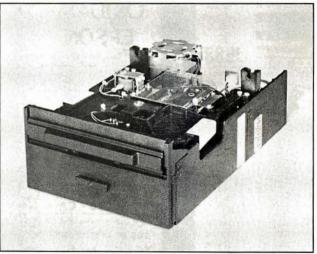


# TRAKSTOR. Your Specialty Store For Drives

LOW, LOW, PRICES!!

#### HIGH PERFORMANCE REMEX FLOPPY DISK DRIVES





#### 5¼" DISK DRIVES

RFD 480 \$275 double sided/double density, 48 tpi (SA 450/TA 101-2 compatible)

RFD 960 \$345 double sided/double density, 96 tpi (SA 460/TA 101-4 compatible)

DC brushless spindle motors for longer life—30,000 hours MTBF!

Specify standard bezel or low profile 2/3 height

TO ORDER: CALL TOLL FREE (800) 358-4888, CALL (800) 358-4798 in Californiα

TERMS: VISA, MC, BAC, Check, Money Order—U.S. funds only. Prices include sales tax. Shipping and handling charges: \$3.00 for first 3 lbs. plus 35¢ for each additional lb. Orders over 50 lbs. sent freight collect.

Shipping weights: 8" drive - 16 lbs.: 51/4" drive - 4 lbs.

#### 8" DISK DRIVES

RFD 2000 \$295
single sided/double density
(SA 801R compatible)

RFD 4000 \$395
double sided/double density
(SA 851R compatible)

FREE TECHNICAL MANUAL WITH EVERY ORDER



#### **TRAKSTOR**

2991 White Star Anaheim, CA 92686

Circle 151 on Inquiry card.

BYTE February 1983 38



high enable pin goes high, allowing the selected output line to go low to turn on the right port.

The address decoding shown in figure 1 is only partial, and if other I/O devices are connected, some additional decoding must be provided. Line Y7 on IC2, the decoder, will be activated when, for example, the cassette recorder of a TRS-80 is used, because its address of 255 (hexadecimal FF) will cause A0, A1, and A2 to go high, activating Y7. For complete address decoding, each line from A2 through A7 could be inverted and NANDed to the A2 connection of the decoder (requiring the addition of two more ICs, a 74LS04 hex inverter, and another 8-input 74LS30 NAND gate). By a variety of other rearrange-

#### This interface extends the 8-bit microprocessor's power into the realm of serious measurement.

ments, the I/O ports may be located anywhere within the 256 possible I/O addresses, except for those reserved by other devices.

#### Operation

The key to understanding the circuit's operation is in the arrangement of control and data lines on IC5, the ICL7109 ADC. Several options are provided for in the device's design, but as employed here, the device is enabled like this: a control byte is sent to the output port to put a 1 on the RUN/HOLD line (pin 26) of the ADC. After a brief delay, this pin is returned low by sending a second control byte to port 1. A high on the RUN/HOLD pin starts a conversion. When the conversion is finished. the ICL7109 signals with a low on the status pin (STA, pin 39). To read the output data from the ICL7109, a third control byte is sent to port 1, this time putting a low on the high-bits-enable pin (HBEN, pin 19). This activates bits 8 through 11 of the converted signal, an overrange indication (bit 12), and a polarity signal (bit 13). During this cycle, the low-order bits (0 through 7) are in a high-impedance state, which means those pins are "invisible" to the data bus.

To get the low bits, another control byte is sent to port 1, putting a low on the low-bits-enable pin  $\overline{\text{LBEN}}$ , pin 18). After that, an INP(0) statement reads the low bits through the input port, 00H. A new conversion cycle takes about 33 ms (milliseconds) with the circuit shown. The last completed conversion is held as long as a low is present at pin 26 of IC5.

#### Circuit Construction

The schematic diagram for this circuit is shown in figure 1b. The diagram also shows the proper pin connections for the DIP (dual-inline package) plug-to-edge-card connector that's required to hook the circuit to either the back of a TRS-80 keyboard unit or an Expansion Interface. (I recommend wire-wrap construction on perfboard.)

# Lyco Computer Marketing & Consultants

**TO ORDER** 

TOLL FREE

800-233-8760

**CALL US** 

In PA 1-717-398-4079

FEBRUARY

ATARI

SPECIALS

810 Disk Drive ... \$429.00 400 32K RAM ... \$CALL\$

NEW ATARI
COMPUTER...\$ CALL\$

80048K...\$499.00



#### ATARI HARDWARE

| 410 CASSETTE RECORDER\$ | 75.GO |
|-------------------------|-------|
| 825 PRINTER\$5          | 85.00 |
| 830 PHONE MODEM\$1      | 49.00 |
| 850 INTERFACE\$1        | 64.00 |

#### **PACKAGES**

| CX481 EN | TERTAINER  | \$  | 69.00 |
|----------|------------|-----|-------|
| CX482 ED | UCATOR     | \$1 | 25.00 |
| CX483 PR | OGRAMMER   | \$  | 49.00 |
| CX494 CO | MMUNICATOR | \$3 | 25.00 |

#### **SOFTWARE**

| CXL4012 MISSILE COMMAND | .\$28.75 |
|-------------------------|----------|
| CXL4013 ASTEROID        | .\$28.75 |
| CXL4020 CENTIPEDE       | .\$32.75 |
| CXL4022 PACMAN          | .\$32.75 |
| CXL4011 STAR RAIDER     | .\$34.75 |
| CXL4004 BASKETBALL      | .\$26.75 |
| CXL4006 SUPER BREAKOUT  | .\$28.75 |
| CXL4008 SPACE INVADER   | .\$28.75 |
| CX8130 CAVERNS OF MARS  | .\$31.75 |
| CX4108 HANGMAN          | .\$12.75 |
| CX4102 KINGDOM          | .\$12.75 |
| CX4112 STATES &         |          |
| CAPITALS                | .\$12.75 |
| CX4114 EUROPEAN         |          |
| COUNTRIES               | .\$12.75 |
| CX4109 GRAPHIT          | .\$16.75 |
| CX4121 ENERGY CZAR      | .\$12.75 |
| CX4123 SCRAM            |          |
| CX4101 PROGRAMMING I    | .\$19.75 |
| CX4106 PROGRAMMING II   | .\$22.75 |
| CX4117 PROGRAMMING III  | .\$22.75 |
| CXL4015 TELELINK        | .\$21.75 |
| CX4119 FRENCH           | .\$39.75 |
| CX4118 GERMAN           | .\$39.75 |
| CX4120 SPANISH          | \$39.75  |
| CXL4007 MUSIC COMPOSER  | .\$33.75 |
| CXL4002 ATARI BASIC     | .\$45.75 |
| CX8126 MICROSOFT        |          |
| BASIC                   | \$65.75  |
| CXL4003 ASSEMBLER       |          |
| EDITOR                  | \$45.75  |
| CX8126 MACRO            |          |
| ASSEMBLER               | \$69.75  |
| CXL4018 PILOT HOME      | .\$65.75 |
| CX405 PILOT EDUCATOR    | .\$99.75 |
| CX415 HOME FILING       |          |
| MANAGER                 | \$41.75  |
| CX414 BOOKKEEPER        | \$119.75 |
|                         |          |
|                         |          |

#### **NEW RELEASES**

| CHOP LIFTER\$27.75 |  |
|--------------------|--|
| APPLE PANIC\$23.75 |  |
| PREPPIE\$19.95     |  |

#### THIRD PARTY SOFTWARE

| EASTERN FRONT 1941      | .\$25.50 |
|-------------------------|----------|
| OUTLAW/HOWITZER         | .\$15.50 |
| WIZARD of WAR           | .\$31.00 |
| GORF                    | .\$31.00 |
| FROGGER                 | .\$26.00 |
| CHOP LIFTER             | .\$27.75 |
| APPLE PANIC             | .\$23.75 |
| PREPPIE                 | .\$19.95 |
| STAR WARRIOR            | .\$28.00 |
| CRUSH, CRUMBLE, & CHOMP | .\$23.00 |
| SHOOTING GALLERY        | .\$19.95 |
| VIDEO MATH FLASH        | .\$12.00 |
| MY FIRST ALPHABET       | .\$25.50 |
| BAḤA BUGGIES            |          |
| TEMPLE of ASPHAI        | .\$27.95 |
| UPPER REACHES           |          |
| of ASPHAI               | .\$15.00 |
| TRACK ATTACK            | .\$23.00 |
| STAR BLAZER             | .\$25.00 |
| LABYRINTH               | .\$23.00 |
| SEA FOX                 | .\$23.00 |
| POOL 1.5                | .\$26.95 |
| SPEEDWAY BLAST (ROM)    | .\$29.95 |
| JAWBREAKER              | .\$22.95 |
| THRESHOLD               | .\$29.95 |
| MOONBASE IO             | .\$23.95 |
| PROTECTOR               | .\$24.95 |
| NAUTILUS                | .\$24.95 |
| SLIME                   | .\$24.95 |
| SUBMARINE               |          |
| COMMANDER (ROM)         | .\$36.95 |
| JUMBO JET               |          |
| PILOT (ROM)             | .\$36.95 |
| SOCCER (ROM)            | .\$36.95 |
| KICKBACK (football ROM) | .\$36.95 |
|                         |          |

#### **PRINTERS**

| Okidata 82A \$479.00       |
|----------------------------|
| Okidata 83A \$719.00       |
| Okidata 84 \$1089.00       |
| Citoh CALL                 |
| Prowriter I                |
| Prowriter IICALL           |
| SMITH CORONA TP-1 \$625.00 |
| NEC CALL                   |
| (Interfacing Available)    |

#### **BUSINESS SOFTWARE**

| ATARI WORD PROCESSING \$109.00 |
|--------------------------------|
| LETTER PERFECT (ROM)\$149.00   |
| LETTER PERFECT (disc)\$129.00  |
| TEXT WIZZARD \$ 89.00          |
| DATA PERFECT \$ 75.00          |
| VISICALC\$169.00               |
| DATASAM/65\$125.00             |

#### **JOYSTICKS**

| ATARI CX-40          | \$18.00 |
|----------------------|---------|
| LESTICK              | \$34.00 |
| WICO COMMAND CONTROL | \$23.75 |
| WICO RED BALL        | \$26.75 |
| WICO TRACK BALL      | \$54.75 |
| STICK STAND          | \$ 6.75 |

#### **COMPUTER COVERS**

| 800      | 9 |
|----------|---|
| 400\$6.9 | 9 |
| 410\$6.9 | 9 |
| 810      | 9 |

#### **PERCOM**

| SINGLE DRIVE (SD) | \$399.00 |
|-------------------|----------|
| SINGLE DRIVE (DD) | \$549.00 |
| DUAL DRIVE (DD)   | \$869.00 |
| DUAL HEAD (DD)    | \$669.00 |



#### **POLICY**



In-Stock items shipped within 24 hours of order. Personal checks require four weeks clearance before shipping. No deposit for COD orders. PA residents add sales tax. All products subject to availability and price change. Advertised prices show 4% discount offered for cash. Add 4% for Mastercard and Visa.

Circle 239 on inquiry card.

TO ORDER
CALL TOLL FREE

800-233-8760

In PA 1-717-398-4079 or send order to Lyco Computer P.O. Box 5088 Jersey Shore, PA 17740

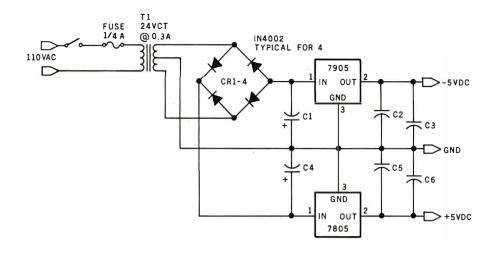


Figure 2: Design of a suggested power supply. The power must be extremely stable if the unit is to live up to its potential.

| DIP Plug                         | Function                         | TRS-80 Edge-<br>Card Connector              |
|----------------------------------|----------------------------------|---------------------------------------------|
| 1<br>4<br>5<br>6<br>2<br>3<br>14 | Gnd A0 A1 A2 IN OUT D0 D1        | 8<br>25<br>27<br>40<br>19<br>12<br>30<br>22 |
| 12<br>11<br>10<br>9<br>8<br>7    | D2<br>D3<br>D4<br>D5<br>D6<br>D7 | 32<br>26<br>18<br>28<br>24<br>20            |

**Table 1:** Connections necessary to hook the ADC board to the edge-card connector of a TRS-80 Model I.

| Addre<br>binary (<br>xxxxx000<br>xxxxx001             |      | Input port activated; otherwise tri-state<br>Output port active; otherwise data latched |
|-------------------------------------------------------|------|-----------------------------------------------------------------------------------------|
| Conti                                                 | rol  |                                                                                         |
| xxxxx111                                              | 7    | Start conversion; output tri-stated                                                     |
| xxxxx110                                              | 6    | Hold when finished; output tri-stated                                                   |
| xxxxx100                                              | 4    | Enable high bits; low bits tri-stated                                                   |
| xxxxx010                                              | 3    | Enable low bits; high bits tri-stated                                                   |
| High E<br>xx1x xxxx<br>xx0x xxxx<br>xxx1 xxxx<br>xxxx | Bits | Positive polarity<br>Negative polarity<br>Out of range signal<br>High data bits         |
|                                                       |      |                                                                                         |

**Table 2:** Useful codes for controlling, addressing, and reading the ADC.

Optimum performance of the ICL7109 depends on a stable and accurate reference voltage and on goodquality capacitors. Although the ADC has an internal voltage reference, using it causes some reduction of circuit flexibility. The Analog Devices AD580 voltage reference shown in figure 1b has excellent thermal and aging characteristics, as does the Datel/Intersil ICL8069. which could be substituted. Good-quality resistors with low temperature coefficients (such as the metal-film RN55 type) should be used to divide the reference voltage. The values used in figure 1b are for a 4.096-V (volt) input scale, with a 2.048-V reference (details on setting the reference voltage for other input scales are given in the Datel/Intersil data sheet supplied with the ICL7109). The capacitors used should not be disc ceramic; polypropylene or Teflon are best, and Mylar is acceptable. A few 0.01-µF (microfarad) disc-ceramic capacitors should be placed on the board to bypass the power supplies.

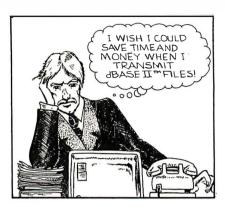
Both +5-V and -5-V supplies are required, for which a good regulated bench supply or the circuit shown in figure 2 will do nicely. The total power drain is about 180 mA (milliamperes) at +5-V, and only a few mA from the -5-V supply. (The connections needed between the DIP plug and the TRS-80 Model I expansion connector are provided in table 1.)

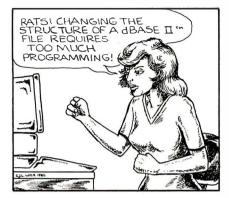
#### Software

The software to generate the control signals and read and process the data may be written either as part of a BASIC program or as an assembly-language subroutine. Speed is not critical for this interface because the ICL7109 is a dual-slope, auto-zero, integrating converter, and its conversion time of 33 ms is relatively slow. Listing 1 on page 386 is a BASIC program that includes a delay for conversion, an over-range message, and polarity correction. Testing each individual bit in BASIC is somewhat clumsy because all data is converted to decimal by the in-

# dBASE II Owners







# **DBPlus Will Save The Day!**

#### Faster than a dBASE II™SORT

Sort a data file on 32 fields, up to 15 times faster than dBASE II.™

## More powerful than a MODIFY STRUCTURE

Transform any dBASE II™ data file, by adding, deleting and modifying fields without any programming knowledge. You can even transfer your data to WordStar/MailMerge.™

## Able to compress huge data files with a simple command

Save up to 70% of your data transmission costs. Perfect for archival storage of important files.

Disguised as a mild-mannered dBASE II™ utility, in reality DBPlus™ heralds a new era in microcomputers. Software designed for value, quality, and use by human beings. Now at a dealer near you!

**DBPlus**<sup>TM</sup>

\$99 Introductory price \$125 after February 1, 1983



661 Massachusetts Avenue Arlington, MA 02174

HumanSoft

(617) 641-1880

DBPlus is a registered trademark of HumanSoft, Inc. dBASE II is a registered trademark of Ashton-Tate, Inc.

# The Best In Price, Selection and Delivery

# Call Now TOLL FREE 800-368-3404

(In VA, Call Collect 703-237-8695)

AMPEX•INTERTEC•TEXAS INSTRUMENTS•GENERAL DATA COMM.•ANDERSON JACOBSON•C. ITOH•QUME • BEEHIVE• DATASOUTH•DIABLO•CENTRONICS • NEC • PRENTICE

| RUNICS THEC TRENTICE                             |
|--------------------------------------------------|
| C. ITOH                                          |
| CIT 101                                          |
| CIT 161 (Color) Call                             |
| TEXASINSTRUMENTS                                 |
| 745 Standard\$1390                               |
| 745 Std. (Reconditioned) Call                    |
| 765 Bbl M'my Call                                |
| 785/787 Call                                     |
| 810 Basic\$1249                                  |
|                                                  |
| 810 Package                                      |
| 820 KSR Package Call                             |
| 840 RO Basic                                     |
| 840 RO Tractor Feed Pkg \$1059                   |
| 940 Video Ed'tr \$1570                           |
| MODEMS                                           |
| PRENTICE STAR 300 Bd\$ 124                       |
|                                                  |
| <b>GDC</b> 1035JL                                |
|                                                  |
| Stat Muxes                                       |
| DISC DRIVES                                      |
| QUME                                             |
| Data Trak 5 \$ 289 or 2 for \$549                |
| Data Trak 8 \$519 or 2 for \$999                 |
| SOFTWARE                                         |
| BISYNC-3780 \$ 769<br>Wordstar (IBM P.C.) \$ 279 |
| Wordstar (IBM P.C.)\$ 279                        |
| Data Star                                        |
| Mail Merge FREE*                                 |
| Spell Star                                       |
| Spell Guard \$ 229                               |
| Plan 80 \$ 249                                   |
| d Base II \$ 529                                 |
| CalcStar \$ 191                                  |
| SuperSort \$ 158                                 |
| Super Calc \$ 249                                |
| InfoStar Call                                    |
| CIS Cobo1 \$ 689                                 |
| Forms II \$ 159                                  |
| MACRO 80 \$ 183                                  |
| "C" Compiler \$ 177                              |
| *With purchase of InfoStar.                      |
| Special! While They Last!                        |
| SOROC TERMINALS                                  |
| 10 100                                           |

QVT-102 ....\$ 594 NOTE: IBM and Burroughs compalible terminals available. Please inquire.

IQ 120 ..... ONLY \$625

In addition, we can make EIA RS 232 or RS 449 cables to your order, and supply you with ribbons, printer stands, print wheels, thimbles for all printers listed. And many, many more items. CALL NOW.

All items shipped freight collect either motor freight or UPS unless otherwise specified. All prices already include 3% cash discount. Purchase with credit card does not include discount. Virginia residents, add 4% Sales Tax. For fastest delivery send certified check, money order or bank-wire transfer. Sorry, no C.O.D. orders. All equipment is in factory cartons with manufacturers' warranty (honored at our depot). Prices subject to change without notice. Most items in stock.

# TERMINALS



TERRIFIC

VISA

Terminals Terrific, Iηc., P.O. Box 216, Merrifield, VA 22116 Phone: 800-368-3404 (In VA, Call Collect 703-237-8695) **Listing 1:** This simple BASIC program for the TRS-80 controls the ADC.

100 DEFINT A,B,D

200 P = -1 : OUT 1,7

300 FOR X=1 TO 5Ø: NEXT X

400 OUT 1,6

500 FOR X=1 TO 100: NEXT X

600 OUT 1,4

 $700 A = INP(\emptyset)$ 

800 OUT 1,3

900 B=  $INP(\emptyset)$ 

1100 IF A< 32 GOTO 1300

1200 A = A-32: P = 1

1300 IF A >= 16 GOTO 2000

1400 D = ((256\*A)+B)\*P

1500 PRINT D

1600 FOR X= 1 TO 200: NEXT X: GOTO 200

1700 END

2000 PRINT "OUT OF RANGE": GOTO 1600

terpreter. The series of steps shown at lines 1000 through 1300 is one way of handling the testing.

Controlling the ADC and testing the status bits is more straightforward in Z80 assembly language because the I/O functions are accomplished with IN and OUT commands and the testing uses the BIT command. For the TRS-80, this can be done as a USR(0)-called subroutine, with the op codes either loaded separately or with a POKE into high memory by a BASIC program. (A summary of control-byte, address, and input-bit patterns is given in table 2 as a quick reference for software design.)

#### Expansion to 14-Bit and 16-Bit Circuits

The I/O control scheme illustrated by this circuit is easily applied to the even greater resolution and accuracy provided by 14- and 16-bit ADCs. Substituting the Datel/Intersil 8068/7104-16 pair of devices for the ICL7109, for example, merely requires the following changes: the output bits must have three-state outputs on the input port's data lines in three overlapping groups, 0-7, 8-15, and OR and POL bits. Besides the three

# We speak your language and translate your software needs into efficient and Quality Services...

DMA products operate on the full range of 8080-8088 processors, including the IBM-PC

# Here's what you can do!

# Data Base Management The FORMULA.

#### The Application Generator™

This unique software package lets you create sophisticated business application software without programming. The FORMULA builds files, reports, updates, sorts, and menus and links them all according to the user's specifications. It incorporates features of a data base manager, a word processor, and a compiler into the first "system language" for microcomputers.

# **Communications**ASCOM™

ASCOM™ is the most versatile asynchronous communication package for microcomputers on the market. It features interactive, menu-driven, and batch operations; supports auto-answer and auto-dial modems; includes most popular protocols; provides network simulation; and many other options. Xerox Corporation, NCR, Monroe Systems for Business, and the big 8 accounting firms use ASCOM.

#### **Utilities**

#### EM80/86TM

This software emulator lets you use eight bit software on sixteen bit microcomputers without hardware modifications.

#### UT-86™

This package of user-friendly utilities for the IBM Personal Computer and similar systems includes copying, directory sorting, patching, and a general purpose file print utility.

#### **Coming Soon**

DMA."C""—A "C" language compiler which will generate either Z80 or 8086 assembly language code. Due to a unique optimization routine which is based upon a functional "P-code" model, the efficiency of DMA."C" will far exceed that of existing compilers.

SYNC/COM — A bisynchronous communication package that will be configurable for a variety of systems and include a flexible interface to the operating system

The 8086 O. S. Converter™ — A program which will permit programs written for Digital Research's CP/M-86™ to execute under IBM's PC DOS.



DYNAMIC MICROPROCESSOR ASSOCIATE 545 FIFTH AVENUE, NY, NY 10017 (212) 687-7115 • Dealer Inquiries only

#### ONE KEY WORD PROCESSING on your **TELEVIDEO**™ with WORDSTAR Mand . . .





Mastercard

- Nu Key<sup>™</sup> Automates the 36 most commonly used word processing functions
- Reduces learning time while increasing operator speed
- For beginners and Wordstar experts
- Comes complete with 14 new matching

For your TELEVIDEO ™ 950, TS-800, TS-800A, and TS-802 PLEASE SEND WORDSTAR SERIAL NUMBER TO:

> Business Solutions, Inc. 91 W. Long Lake Rd., Suite 9 Bloomfield Hills, MI 48013 (313) 540-3360

DEALER INQUIRIES INVITED

TELEVIDEO & TELESOLUTIONS TM OF TELEVIDEO / WORDSTAR TM OF MICROPRO INTERNATIONAL NUKey TM OF BUSINESS SOLUTIONS, INC

# Reliable Business

DATASMITH software requires no previous computer experience, so it can be used effectively by your present office staff. The menu-driven systems feature extensive error detection and correction facilities, so they are "friendly" to the user.

- GENERAL LEDGER. Everything you need to keep the books. Features easy-to-use data entry and error correction, trial balance, fast post, and a variety of comprehensive reports. Automatic error detection keeps the books in balance. Writes checks and makes journal entries in one operation.
- PAYROLL. A very flexible system that adapts to a wide variety of needs. Features Federal, state, and local tax calculations, El credit, and special pay and deduction amounts. Prints all necessary reports, paychecks, and W-2 forms.
- DATA MANAGER. A powerful generalized data management system that lets you define, enter, update, sort, select, and print reports from a database of your own design. Applicable to almost any job where records must be kept, this system can replace literally hundreds of programs.

Put your computer to work with these sophisticated systems now. Programs are available for 48K or larger two-disk systems in your choice of code for Microsoft BASIC-80® under CP/M®, IBM® Personal Computer BASIC, or Micropolis® BASIC.

Box 8036, Shawnee Mission, KS 66208, (913) 381-9118

(3a)

#### Analog-to-Digital Converter Parts

| IC1           | 74LS30                                         |
|---------------|------------------------------------------------|
| IC2           | 74LS138                                        |
| IC3,IC4       | 8212, Intel                                    |
| IC5           | ICL7109CPL, Datel/Intersil                     |
| IC6           | AD580, Analog Devices (ICL8069 from Intersil   |
|               | may be substituted)                            |
| C1            | 2 μF, 16 V tantalum                            |
| C2            | 0.01 μF, 25 V polypropylene                    |
| C3            | 0.15 μF, 25 V polypropylene                    |
| C4            | 0.33 μF, 25 V polypropylene                    |
| R1            | 20 kΩ, 15-turn Cermet trimmer                  |
| R2            | 10 kΩ, ¼ W 1% RN55-type metal film             |
| R3            | 1 MΩ, ¼ W 5% carbon film                       |
| R4            | 200 kΩ, ¼ W 1% RN55-type metal film            |
| CY1           | 3.58 MHz TV crystal                            |
| Plug          | 14-pin DIP socket and mating insulation-       |
|               | displacement connector                         |
| Miscellaneous | Two 14-pin DIP sockets; one 16-pin DIP socket; |
|               | two 24-pin DIP sockets; one 40-pin DIP socket  |
|               | (wire-wrap); 14-conductor ribbon or insulated  |
|               | cable; wire-wrap wire.                         |

(3b)

#### Power Supply Parts

| T1        | Transformer, primary 110 V AC, secondary 24 V,  |
|-----------|-------------------------------------------------|
|           | C.T. at 0.3 A                                   |
| CR1-4     | 1N4002, or suitable bridge rectifier            |
| C1        | 470 μF, 16 V electrolytic                       |
| C4        | 1000 μF, 16 V electrolytic                      |
| C2,C5     | 1 μF, 16 V electrolytic                         |
| C3,C6     | 0.01 μF, 25 V ceramic                           |
| 7805,7905 | Three-terminal IC voltage regulators. LM320/340 |

Three-terminal IC voltage regulators. LM320/340 series in T0-220 package are equivalent.

Table 3: Parts lists for the converter (3a) and its power supply (3b).

output-control lines (RUN/HOLD, LBEN), a fourth, MBEN, is added, and the middle bits are gated onto the data bus in their turn. A few extra lines of code in the software-driver routine, and you're in business.

A second ICL7109 converter could be added by using one of the six unused addresses from IC2, three of the unused output lines on port 01H, and by connecting the three-state output lines of the second ICL7109 onto the secondary data bus going into the 8212 input port. For more than two channels, however, this is probably not as economical as employing the ADC with a multiplexed analog input, which could also be controlled by unused lines on the output port. The circuit could be easily adapted for other popular microcomputers, such as the Apple II, or for S-100 systems, by picking up the appropriate equivalents of the IN and OUT signals from the

This interface extends the 8-bit microprocessor's power into the realm of serious measurement. The principle of using three-state buffers to pass multiple output bytes through a single input port allows a degree of resolution and accuracy usually reserved for expensive equipment, at a total cost of a weekend and less than \$100. ■

#### THE FORTH SOURCE™

#### MVP-FORTH - A Public Domain Product MVP-FORTH PRODUCTS for CP/M® IBM-PC® and Apple® MVP-FORTH Programmer's Kit including disk with MVP Forth is fig-FORTH modified by 100% of the FORTH-79 Standard documentation, ALL ABOUT FORTH, and STARTING Required Word Set plus the vocabulary for the instructional book Starting FORTH. Assembly source listing versions. \$100 FORTH. Editor, assembler and utilities are included 1] MVP-FORTH Disk with documentation. Assembly source listing version Transportability of programs is assured since the kernal of MVP-FORTH LI MVP-FORTH Cross Compiler with MVP-FORTH source in is the same for all computers to the machine dependent READ/WRITE \$300 instructions FORTH MVP-FORTH Programming Aids for decompiling. Modification and extension (up or down) is simplified by having the callfinding, and translating. Specify computer. source code and through the use of MVP-FORTH Programming Aids and MVP-FORTH Fast Floating Point for Apple II/II + on board Cross Compilers. with 9511 math chip. Requires MVP-FORTH for Apple\$400 The CP/Me are supplied on 8", SS/SD, IBM 3740, format disks. The ☐ MVP-FORTH Assembly Source Printed listing. include a track and sector calculation array for down loading to other [ ALL ABOUT FORTH by Haydon. MVP-FORTH reference, sizes and formats. Other disks are machine specific. plus fig-FORTH and FORTH-79. \$20 All About FORTH is an annotated glossary of MVP-FORTH words as well \* ★ ★ MVP-FORTH operates under a variety of CPU's. computers. as other dialects. It is in 8080 code, other MVP-FORTH implementations and operating systems. Specify your computer and operating system. CP/M supplied on 8", SS/SD, 3740 format. ★ ★ ★ include documentation of the differences between it and other CPU's and computers. FORTH DISKS FORTH MANUALS, GUIDES & DOCUMENTS ☐ ALL ABOUT FORTH by AIM FORTH User's FORTH with editor, assembler, and manual \$12 □ PET\* by FSS Haydon. An annotated Manual ☐ APPLE II/II+ by \$90 glossary of common FORTH \$100 APPLE User's Manual ☐ TRS-80/I\* by Nautilus MicroMotion words, MVP-FORTH \$20 MicroMotion \$90 \$90 APPLE II by Kuntze Systems reference. ☐ TRS-80 User's Manual ATARI® valEORTH ☐ 6800 by Talbot \$50 ☐ And So FORTH by Huang. A \$19 **MMSFORTH** \$100 □ CP/M\* by MicroMotion \$100 Microsystems college level text. **METAFORTH** by Cassady 6809 by Talbot CROMEMCO by Inner FORTH Encyclopedia by Meta compiler in 8080 \$100 Microsystems \$100 Access Derick & Baker. A complete \$30 □ **Z80** by Laboratory HP-85 by Lange \$90 programmer's manual to fig-Systems Guide to fig-Microsystems FORTH with FORTH-79 IBM-PC® by Laboratory FORTH \$25 ■ 8086/88 by Laboratory references. Flow charted, Microsystems ☐ Caltech FORTH Manual \$12 \$100 Microsystems 2nd Ed. NOVA by CCI, quad \$20 ☐ Invitation to FORTH ☐ VIC FORTH byHES, VIC20 ☐ Starting FORTH by Brodie. \$100 floppy PDP-11 FORTH User's cartridge Best instructional manual \$20 Manual available. (soft cover) Enhanced FORTH with: F-Floating Point, G-Graphics, T-Tutorial, Starting FORTH (hard □ CP/M User's Manual. S-Stand Alone, M-Math Chip Support, MT-Multi-Tasking, X-Other \$20 MicroMotion \$20 Extras, 79-FORTH-79. ☐ FORTH-79 Standard 1980 FORML Proc. \$25 APPLE II/II + by Micro-TRS-80/I or III by Miller 1981 FORML Proc. □ FORTH-79 Standard \$140 Motion, F. G. & 79 Microcomputer Services. \$10 2 Vol. \$40 Conversion F. X & 79 ATARI by 1982 FORML Proc. \$25 Tiny Pascal in PNS, F, G, & X. ☐ TUTORIAL by Laxen & \$90 fig-FORTH \$10 ☐ 1981 Rochester FORTH Harris, CP/M with a copy of CP/M by MicroMotion. □ NOVA fig-FORTH by CCI Proc \$25 Starting FORTH \$95 F & 79 with editor, assembler, and ☐ 1982 Rochester FORTH ☐ Apple II/II + , GraFORTH by ☐ Extensions for Laboratory utilities \$25 Proc. Microsystems IBM, Z80, and Insoft, stand alone ☐ MVP-FORTH Source Listings ☐ Using FORTH \$25 8086 graphics □ IBM-PC □ CP/M ☐ Software Floating ☐ A FORTH Primer \$25 LJ H89/Z89 by Haydon, ☐ Apple II/II+ \$20 Point \$100 ☐ Threaded Interpretive T & S ☐ 8087 Support Languages ☐ **H89/Z89** by Haydon, T \$175 (IBM-PC or 8086) \$100 ☐ Installation Manual for fig-FORTH, contains FORTH ☐ IBM-PC, PolyFORTH by ☐ 9511 Support model, glossary, memory map and instructions FORTH Inc (Z80 or 8086) \$100 F, G, S, M, MT, & X \$300 Color Graphics Source Listings of fig-FORTH, for specific CPU's and computers. The Multi-Tasking FORTH by (IBM-PC) \$100 Installation Manual is required for implementation. Shaw Labs, CP/M, Data Base F1 1802 □ 6502 6800 □ AlphaMicro X & 79 \$395 Management [ ] 8080 □ 8086/88 □ 9900 ☐ APPLE II CROSS COMPILERS Allow extending, modifying and compiling for ☐ PACE □ 6809 □ NOVA ☐ PDP-11/LSI-11 speed and memory savings, can also produce ROMable code. •Requires □ Eclipse □ VAX 68000 FORTH disk Ordering Information: Check, Money Order (payable to MOUNTAIN VIEW PRESS) LI IBM• CP/M \$300 \$300 INC.), VISA, MasterCard or COD's accepted. No billing or unpaid PO's. California J H89/Z89 \$300 1 | 8086 \$300 residents add sales tax. Shipping costs in US included in price. Foreign orders, pay in US funds on US bank, include for handling and shipping by Air. \$5 for each item under \$25, \$10 for each item between \$25 and \$99 and \$20 for each item over TRS-80/I \$300 [ ] Z80• \$300 [ | Apple II/II + \$300 ■ Northstar\* \$100, Minimum order \$10. All prices and products subject to change or withdrawal without notice. Single system and/or single user license agreement required on fig-FORTH Programming Aids for decompiling, callfinding and translating. Specify CP/M, IBM-PC, 8086, Z80, or Apple II/II + \$150 DEALER & AUTHOR INQUIRIES INVITED

## MOUNTAIN VIEW PRESS, INC.

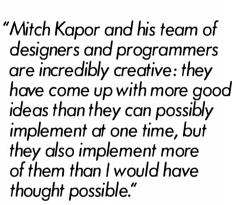
**PO BOX 4656** 

**MOUNTAIN VIEW, CA 94040** 

(415) 961-4103

Circle 290 on inquiry card.

BYTE February 1983 389



Gregg Williams, BYTE magazine, December, 1982



# LOTUS

55 Wheeler Street, Cambridge,

Massachusetts 02138 (617) 492-7171



1-2-3 will be shipped to dealers on January 26, 1983.

# Shape-Table Graphics for the TRS-80

Draw complex shapes with a single command.

Dan Rollins Apartment C 134 Olive St. Glendale, CA 91206

In the fast-moving world of computer graphics, the TRS-80 Model I and III programmer seems to have been forgotten. When the local Apple users group meets, members admire each other's high-resolution graphics creations while discussing the details of vector plotting, video paging, and shape tables. And all the while, the TRS-80 owner carefully calculates SET/RESET/PRINT @ positions and curses the limitations of these commands.

Ever wish you could draw a complex shape on the screen of your TRS-80 with a single command? Could you use a command for magnifying the size of that shape by using a scaling factor? How would you like to be able to "build" a page of graphics and characters in memory, then move it to the screen at machine-language speeds? Well, the KWIKDRAW program will painlessly add these functions to your repertoire.

KWIKDRAW is a machine-language routine (see listings 1 and 2) that was developed to be used interactively with BASIC. This combination of machine-language speeds and BASIC flexibility allows freedom and ease found in neither medium independently. Additionally, the routine can be located on a BASIC program line. It need not be loaded separately as a SYSTEM tape nor will MEMORY SIZE ever need to be answered. It is loaded along with the BASIC application program.

The methods to accomplish this have been covered in a previous article (see "Vector Graphics for the TRS-80,"

BYTE, January 1983, page 371) and will not be repeated here. In essence, a BASIC program uses POKE commands to insert Z80 op codes into a prepared dummy string on a program line. The address of that string is used as the point to which control is passed via the USR command. Any such routine must be fully relocatable and contain no op-code bytes with values of 00 or 22 hexadecimal.

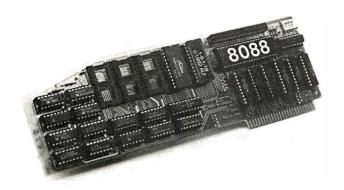
#### Vectors

In this article, the word *vector* will be defined as a control code used in moving a cursor for plotting points of a video-screen matrix. Using compass points as an analogy, a vector will be interpreted as motion north (up), south (down), west (left), and east (right), or as any combination of these motions, i.e., northeast (up and right).

Starting at a key position, a vector will advance this cursor in any of eight directions. The new screen position may then be turned on, turned off, or skipped. From this point, another vector will further advance the cursor and take the required action. A series of such vectors may be used to define a *shape*—the basic building block for all graphics applications. A series of shapes, drawn rapidly on the screen, might be used to animate a figure.

Couple this shape-drawing function with the ability to change the shape's key position from drawing to drawing; add the options of enlarging or reducing the size and

# The speed and power of an IBM PC on a \$345 Apple<sup>®</sup> card.



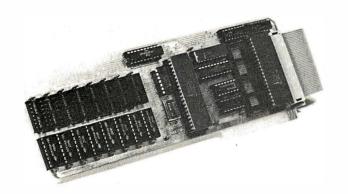
# FAST 5 MHZ OPERATION, TRUE MULTIPROCESSING

ALF's AD8088 Processor Card adds a fast 16-bit 8088, the processor used in the IBM PC, to your Apple II. It runs programs from its on-board memory at a full 5 MHz—12% faster than the IBM PC—while the Apple also runs at full speed. And two or more AD8088's can be used in one Apple, to tackle problems that are beyond many mainframe systems.

#### CP/M-86 AND 192K MEMORY

CP/M-86®, the 8088 version of the industry standard CP/M operating system, is available for the AD8088 for only \$200. AD8088 CP/M-86 uses the popular Microsoft Softcard® disk format so you can buy the latest programs direct from major software distributors like Lifeboat Associates.

CP/M-86 uses only 18K, leaving 46K for programs on a 64K Apple—easily enough memory to assemble 12K of object code. For large programs, our \$370 AD128K Memory Card provides 110K



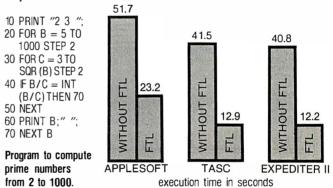
program space, or 174K program space (192K system memory) for an extra \$75.

#### THE 8087 NUMERIC DATA PROCESSOR

The AD128K Memory Card features a socket for the Intel 8087 Numeric Data Processor. The 8087's 80-bit internal format gives 18 digits of accuracy (Applesoft has only 9). Its speed is equally impressive: it multiplies two 80-bit floating-point numbers faster than the Apple runs 10 machine codes!

# FASTER APPLESOFT FOR SCIENTIFIC & ANALYTICAL PROGRAMS

Any program can be rewritten for fast operation with the 8088, but ALF's "FTL" program speeds up math in your existing Applesoft programs—without modification. FTL is activated simply by typing RUN FTL. Programs produced by TASC® or Expediter II® also run faster. The graphs below show the dramatic improvement with FTL.



#### RELIABLE LOW POWER OPERATION

The clean design of the "AD" series separates the two main components—processor and expansion memory, when needed—on two cards. Low-power components are used for cooler operation: each card draws less than an Apple ROM card—far less than a typical 80-column card.

#### SEE YOUR APPLE DEALER TODAY

An Apple II computer with 64K (48K plus Language Card equivalent) and 13- or 16-sector disk drive is required. The AD8088 and AD128K can be used in any slot.

Trademarks: "Apple": Apple Computer, "TASC", "Softcard": Microsoft, "Expediter II": Einstein/Goodrow, "CP/M-86": Digital Research



A L F PRODUCTS INC. 1448 ESTES DENVER, CO 80215 (303) 234-0871

## \$595.00

#### The Last Expansion Unit You Will Ever Have To BUY

The six most commonly required add-on features for your IBM PC

#### Without Using Any Additional Slots!

- Six additional system slots.
- Up to 256k of additional memory with our exclusive DPECC (R) (Dynamic Parity Error Correcting Circuitry)\*
- Two Asynchronous serial ports.\*
- Three parallel ports.\*
- Real Time Clock.\*



The 256k RAM, 2 asynchronous serial ports, 3 parallel ports, and a Real Time Clock are all built on to the motherboard, so you won't have to waste precious slots on them.

The Expansion Unit comes without these options installed.\* So you don't have to pay for them if you don't need them. But when you do, all you have to do is plug in the chips and you are ready to go.

\*All options are available installed with the Expansion



2116 WALSH AVENUE SANTA CLARA, CA 95050 (408) 727-7548

## The one place for all your business & personal computing needs!

We specialize in Speed, Selection & Service!

From business management and accounting software. to the latest entertainment - whatever you need is yours -FAST - from MICRO-MANIA!

We've got the biggest selection and fastest service on:

- Software Packages
- Computer Supplies (including ribbons for OKI-DATA, ANADEX & EPSON printers)
- Stock & Customized Forms (for all software packages)
- Labels for all printers
- Books from Addison-Wesley and others\*
- and much more!

Send for our FREE catalog!

#### \*Addison-Wesley's popular Pocket Guides

Learn programming the easy, Addison-Wesley way! Their Programming Pocket Guides are just \$6.95 each. Choose BASIC, COBOL, FORTRAN, PASCAL or general PROGRAMMING.



FREE

shipping

MICRO-MANIA Dept. B2 • P.O. Box 3048 • Peabody, MA 01960-3048 Call Collect 617-532-5930

Most orders shipped within 24 hours!

Defining a Shape The easiest way to explain how to define a shape is to

| Direction | Vector Character |           |  |
|-----------|------------------|-----------|--|
|           | Move and Plot    | Move Only |  |
| N         | Α                | 1         |  |
| S         | В                | 2         |  |
| N then S  | С                | 5         |  |
| E         | D                | 4         |  |
| NE        | E                | 5         |  |
| SE        | F                | 6         |  |
| W         | Н                | 8         |  |
| NW        | 1                | 9         |  |
| SW        | J                | :         |  |
|           |                  |           |  |

Table 1: Shape-definition characters interpreted by the KWIKDRAW program. The letters A through I will move and plot the cursor position, while the numbers 1 through 9 and the colon will only move the cursor.

changing the color of the shape; and we have motivation for the invention of shape-table graphics for the TRS-80 and the reason for KWIKDRAW.

KWIKDRAW interprets a BASIC character string as a series of vectors. Shapes are drawn using pixels or any displayable character. A shape may be enlarged by a scaling factor of 2 to 256 and may be drawn anywhere on or partially off the screen. *Pages* of shapes may be stored in memory for rapid sequential recall.

In writing KWIKDRAW, I decided that ease of programming was more important than using the memorystringy "bit-stream" method employed in Applesoft.

Shape-interpreters are notorious for being difficult to work with. Applesoft, for example, requires that a shapetable be created as a series of 3-bit codes. The first 2 bits indicate direction (up, down, left, right), and the third indicates a plot/don't-plot action. Byte boundaries are ignored except in defining the end of the shape. These rules tend to make shape defining a complex proposition.

Table 1 contains the shape-definition characters that are interpreted by KWIKDRAW, Notice that all characters may be entered from the keyboard. Though only 5 of the 8 bits of an ASCII (American Standard Code for Information Interchange) character are needed for defining a vector, I decided that ease of programming was more important than using the memory-stingy "bit-stream" method seen in Applesoft. Also, note that provisions are made for moving the cursor without changing the background upon which the shape is drawn.



#### The Well-Tempered Cross-Assembler

Before Johann Sebastian Bach developed a new method of tuning, you had to change instruments practically every time you wanted to change keys. Very difficult.

Before Avocet introduced its family of cross-assemblers, developing micro-processor software was much the same. You needed a separate development system for practically every type of processor. Very difficult and very expensive.

But with Avocet's cross-assemblers, a single computer can develop software for virtually any microprocessor! Does that put us in a league with Bach? You decide

#### **Development Tools That Work**

Avocet cross-assemblers are fast, reliable and user-proven in over 3 years of actual use. Ask NASA, IBM, XEROX or the hundreds of other organizations that use them. Every time you see a new microprocessorbased product, there's a good chance it was developed with Avocet cross-assemblers.

Avocet cross-assemblers are easy to use. They run on any computer with CP/M\* and process assembly language for the most popular microprocessor families.

| XASMO5 6805<br>XASMO9 6809<br>XASM18 1802<br>XASM48 8048/8041<br>XASM51 8051<br>XASM65 6502<br>XASM68 6800/01<br>XASMF8 F8/3870<br>XASMZ8 Z8<br>XASM400 COP400 | \$200<br>each |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| XASM75 NEC 7500                                                                                                                                                | \$500         |
| (Coming soon: XASM68K                                                                                                                                          | 68000)        |

#### Turn Your Computer Into A Complete Development System

Of course, there's more. Avocet has the tools you need from start to finish to enter, assemble and test your software and finally cast it in EPROM:

**Text Editor VEDIT** -- full-screen text editor by CompuView. Makes source code entry a snap. Full-screen text editing, plus TECO-like macro facility for repetitive tasks. Pre-configured for over 40 terminals and personal computers as well as in userconfigurable form.

| CP/M-80 version              | \$150       |
|------------------------------|-------------|
| CP/M-86 or MDOS version      | \$195       |
| (when ordered with any Avoce | et product) |

In-Circuit Emulators -- MICE In-Circuit Emulator by Microtek. Full capability emulation in a compact, inexpensive device. Accepts high-level ASCII commands through RS 232 serial interface. Down-loads programs generated by Avocet cross-assemblers ... examine and modify memory and registers, access I/O ports and control program execution in single instruction and single-cycle modes. Forward and backward tracing for up to 256 qualified cycles ... Assembly/Disassembly commands with symbolic labels make it easy to modify the program under test

MICE-I versions for 6502, 8048, 8085, NSC 800 and Z-80....... \$1.795 each.

MICE-II versions with 2K trace and 32K program memory, plus real-time emulation and hardware break points for 6502, 6809, 68000, 8085 and 8086/8088 ....

... \$3,995.

(6805 and 8051 versions available starting second quarter)

ROM Simulator -- ROMSIMby Inner Access eliminates need to erase and reprogram EPROM. Installed in an S-100 host, ROMSIM substitutes RAM for EPROM in external target system. 16K memory can be configured to simulate the 2708, 2758, 2716, 2516, 2732, 2532, 2764, 2564 in either byte or word organization. Avocet's configurable driver makes loading of HEX or COM files fast and easy.

From \$495 depending on cabling and RAM installed.

EPROM Programmer -- Model 7128 EPROM Programmer by GTek programs most EPROMS without the need for personality modules. Self-contained power supply ... accepts ASCII commands and data from any computer through RS 232 serial interface. Cross-assembler hex object files can be down-loaded directly. Commands include verify and read, as well as partial programming.

PROM types supported: 2508, 2758, 2516, 2716, 2532, 2732, 2732A, 27C32, MCM8766, 2564, 2764, 27C64, 27128, 8748, 8741, 8749, 8742, 8751, 8755, plus Seeq and Xicor EEPROMS.

(Upgrade kits will be available for new PROM types as they are introduced.)

| Programmer                 | \$389 |
|----------------------------|-------|
| Options include:           |       |
| Software Driver Package    | \$ 30 |
| RS 232 Cable               |       |
| 8748 family socket adaptor | \$ 98 |
| 8751 family socket adaptor |       |

#### Call Us

If you're thinking about development systems, call us for some straight talk. If we don't have what you need, we'll help you find out who does. If you like, we'll even talk about Bach.

VISA and Mastercard accepted. All popular disc formats now available -- please specify. Prices do not include shipping and handling -- call for exact quotes. OEM INQUIRIES INVITED.

\*Trademark of Digital Research.

302-734-0151



395

Circle 42 on inquiry card.

BYTE February 1983

```
00100 #
 PROGRAM ID :
 KWIKDRAW
00110 ;
 PROGRAMMER :
 Dan Rollins
00120 #
 DATE
 09/24/81
00130 #
00140 #
 Program Abstract :
00150 #
 This program interprets a string of
00160 $
 control characters as a graphics shape,
00170 $
 placing it on the screen at the position
00180 7
 defined as an X,Y coordinate, scaled to
00190 #
 a given value and drawn with either lit
00200 #
 or unlit rixels or any displayable
00210 #
 character.
00220 #
 KWIKDRAW requires a BASIC string of
00230 #
 "vector definition" bytes and & control
00240 #
 panameters. These control parameters are
00250 #
00230 $
 passed to the routine by placing them in
 elements of an INTEGER array:
00270 #
00280 #
00290 #
 PX(0) = X \text{ ordinate } (0-127 \text{ or } 0-63)
00300 #
 f''(1) = Y \text{ ordinate } (0-47 \text{ or } 0-15)
00310 #
 P%(2) = VARPTR(shape definition string)
00320 #
 P%(3) = SET/RESET/CHARACTER bute :
 O=RESET, 1=SET, else=CHARACTER
00330 $
 P%(4) = scaling factor (1-255)
00340 $
 PX(5) = pasins argument:
00350 ;
 O=page OUT, DRAW, page IN
00360 $
 1=page OUT, DRAW (build a page)
00370 $
 2=DRAW, page IN (display a page)
00380 #
 3=DRAW only (don't page)
00390 #
00400 #
 PX(3-517) = working storage for screen
00410 #
 Once these values are defined, KWIKDRAW is
00420 #
00430 $
 called via:
00440 $
 UU=USR(VARPTR(P%(O)))
00450 ;
00460 #
 The shape definition string is composed of characters which are interpreted by KWIKDRAW
00470 $
00480 #
00490 $
 as motions of a cursor - where bits indicate
00500 ;
 motion North, South, East, West or combinations
00510 #
 thereof.
00520 #
 NORTH
 = bit 0
 (char AND 1)
00530 #
 SOUTH = bit 1
 (char AND 2)
00540 $
 = bit 2
00550 #
 EAST
 (char AND 4)
 = bit 3
00560 1
 WEST
 (char AND 8)
 MOVE (don't plot) = bit 5
 (char AND 32)
00570 #
00580 #
00590 $*********** CHART OF CONTROL CHARACTERS ***********
00600 3業業
 **
00610 7米米
 **
 direction
 Plot/move
 move only
00620 身準準
 **
 "A" /
"B" /
"C" /
"II" /
 / "1"
/ "2"
/ "3"
/ "4"
/ "5"
00630 非常常
 И
 **
00640 身本本
 S
 /
 **
00350 非米米
 (plot only) /
 **
 E /
00660 多米米
 **
00670 非常来
 ΝE
 **
 1
 n E n
 "6"
00680 #**
 SE
 **
```



"The computer company says call the software company. The software company says call service. Service says it's not in the contract; read the training manual. And nobody understands the manual."

# Monroe eliminates a major source of trouble for computer buyers.

#### Too many sources.

When it comes to buying a computer, the more people you deal with, the lonelier it can get. Fortunately there's one computer company that does business differently: Monroe.

We offer one of the most advanced business microcomputer systems in the world. But unlike our competitors, we accept complete responsibility for your computer system after you buy—even if you buy only one.

#### Software that's easy to use.

Monroe software covers a wide range of applications, is designed for productivity and is easy to use. Our Extended Basic is closer to everyday English than



competitive Basics. An extensive CP/M®-based library is available. We even offer a software maintenance contract.

Your Monroe representative

MONROE Systems For Business

is responsible to you. That's the only way we've done business for 70 years. For more information or a free demonstration *in your office*, call or write now.

800-526-7843 Ext. 444

(in New Jersey 800-522-4503

Ext. 444)

Monroe Systems For Business

The American Road

Morris Plains, New Jersey 07950

- ☐ Yes, I'd like a free demonstration in my office.
- ☐ Please send me more information on your computers.

Name \_\_\_\_\_

Company \_\_\_\_\_

....

At your side every step of the way.

CP/M is a registered trademark of Digital Research Inc.

```
00690 非米米
 "H"
 Ш
 " 2 "
 **
 00700 3**
 NW
 "I"
 "9"
 **
 00710 #**
 SW
 ",]"
 11 1 11
 **
 00720 3**
 **
 00740
 00750
 These characters also have unused bits
 00760 #
 set, but allow for Keyboard entry.
 00770 $
 00780 $
 Elements of the share table cause the
 00790 #
 internal pointer to FIRST be adjusted,
 00800 ;
 then the roint is plotted.
 00810 ;
 00820 #
 When bit 5 is ON, the pointer is moved
 00830
 without any character or pixel alteration
 00840
 00850 #

 The program is fully relocatable and

 00860 #

 suitable for "packing" into a BASIC

 00870 #

 string within a program line.

 00880
 00900 ;
 \langle \rangle
 00910 ;
 offsets from USR
 <>
 name of BASIC
 00920 $
 argument address-1
 ♦
 variable
 00930
 ♦
000 I.
 00940 XPOS
 EQU
 +1
 ;P%(0)
 \Diamond
0003
 00950 YPBS
 EQU
 +3
 ;P%(1)
 \langle \rangle
0005
 00960 PTRLSB
 EQU
 \langle \rangle
 +5
 ;P%(2)
 <>
000 6
 00970 PTRMSB
 EQU
 +6
 ŏ
◊
◊
0007
 00980 SRBYTE
 EQU
 +7
 (P%(3)
0009
 00990 SCALE
 EQU
 +9
 ; P%(4)
000 13
 01000 PAGER
 EQU
 +11
 ;P%(5)
 01010 #
 ♦
 01030 #
0000
 01040
 ORG
 0
 relocatable code
0000 CDZFOA
 01050
 CALL
 0A7FH
 iset ARG from BASIC
0003 E5
 01060
 PUSH
 HL
 point IX index register to
0004 DDE1
 01070
 POP
 control parameter array
 IX
000 6 MIZE
 01080
 DEC
 IX
 Offsets from IX must not be 0
 01090 $
0008 110001
 01100
 DE : 010CH
 LI
0003 15
 01110
 DEC
 TI
 FDE = 12
 01120
000C 19
 AUU
 HL, I'E
 ;HL => start of storage-
000 D E5
 01130
 PUSH
 HL
 ; area (integer array)
COOR FRE1
 01140
 POF
 IY
 ;save in IY resister
 01150 #
 01160 These lines "rage" OUT of video memory into the
 01170 fatorage area within a BASIC integer array.
 The section is skipped if the paging argument--P%(5)--
 01190 fis 2 or 3
 (bit 1 is ON).
 01200 #
0010 DDCBOB4E 01210
 RIT
 1, (IX+PAGER)
 i_{\text{Pasing ars}} = 2 \text{ or } 3?
0014 200B
 01220
 JR
 NZ, POSKIP
 ; then skip.
 Else
 01230 #
0016 EB
 01240
 ΕX
 DE, HL
 juse array as destination
0017 210130
 01250
 LI
 HL # 3001H
001A 2B
 01230
 DEC
 HL
 # HL => source (screen)
001B 01FF03
 01270
 LI
 BC,3FFH
001E 03
 01280
 INC
 BC
 # BC is byte count (1024)
```

# Micromint will put both a computer development system and an OEM dedicated controller in the palm of your hand for as little as \$127."

The Z8 Basic Computer/Controller represents a milestone in microcomputer price-performance. The entire computer is 4" by 4½" and includes a tiny BASIC interpreter, 4K bytes of program memory, one RS-232 serial port and two parallel ports plus a variety of other features. The Z8 microcomputer board is completely self-contained and optimized for use as a dedicated controller. Can be battery operated. Comes withover 200 pages of documentation.

#### **Z8 BASIC COMPUTER/CONTROLLER**



- Uses Zilog Z8671 single chip microcomputer
- On board tiny BASIC interpreter
- 2 parallel ports plus serial I/O port.
  Just connect a CRT terminal and
- write control programs in BASIC

  4K bytes of RAM. EPROM pin compatible
- Baud rates 110-9600 BPS
- Data and address buses available for 124K memory and I/O expansion
- Consumes only 1.5 watts at +5, +12
   & -12v.

BCC01 Z8 Basic Computer
Assembled & Tested . . \$199.00 P
BCC02 Z8 Basic Computer
Kit . . . . . . . . \$169.00

COMING SOON

A/D Converter 8 Channel 8 Bit AC I/O Board

- 4 Channel 115Vac inputs
  4 Channel 115Vac outputs
- 20 MA ADAPTER

Z8 MEMORY. I/O EXPANSION & CASSETTE INTERFACE



The Z8 Memory, I/O Expansion & Cassette Interface Board (Z8 Expansion Board for short) allows you to add up to 8K of additional memory plus three 8-bit parallel ports to your Z8 Basic Computer/Controller. The memory expansion will support any combination of byte wide RAM memory chips or 2716 or 2732 EPROM. The cassette interface is 300 baud Kansas City Standard (2400Hz/1200Hz).

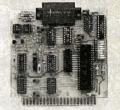
BCC03 Z8 Expansion Board w/4K memory . . . . . . \$140.00 BCC04 Z8 Expansion Board w/8K memory . . \$170.00 **Z8 EPROM PROGRAMMER** 



The EPROM Programmer board allows you to transfer application programs in BASIC or Assembly language directly from RAM to either 2716 or 2732 EPROMS. Requires 28 Basic Expansion Board for operation.

NOTE: We recommend the higher current UPS03 or UPS04 power supply when using the EPROM Programmer.

BCC07 Z8 EPROM Programmer Assembled & Tested ... \$145.00 **Z8 SERIAL EXPANSION BOARD** 



The Serial Expansion Board adds an additional RS-232C serial port to the Z8 system. It runs at 75 to 19,200 baud in all standard protocols. The 20 ma. current loop is opto-isolated for reliability and protection.

BCC08 Z 8 Serial Board Assembled & Tested ... \$180.00

MOTHER-BOARD
MB02 Z8 Mother Board
with 5 connectors (Gold)
Assembled & Tested .... \$81.00

UNIVERSAL POWER SUPPLY

+5 @ 300 ma. +12 & -12 V @ 50 ma. UPS01 Assembled and Tested . . . . . \$ 35.00 UPS02 Kit . . . . . . \$ 27.00

+5 @ 1 amp. +12 & -12 V @ 50 ma. UPS03 Assembled and

UPS04 Kit ...... \$ 50.00

**Z8 CROSS ASSEMBLERS** 

FROM ALLEN ASHLEY XAS01 For TRS-80 Mod I \$ 75.00 XAS02 For TRS-80 Mod III\$ 75.00 XAS03 For CP/M-8" ....\$150.00

FROM MICRO RESOURCES
MR01 CP/M-8" Diskette . \$ 75.00
MR02 APPLE II CP/M 51/4" \$ 75.00

HERE

MICROMINT INC. 561 Willow Avenue Cedarhurst, NY 11516

To Order: Call Toll Free 1-800-645-3479 For Information Call: 1-516-374-6793

Circle 261 on inquiry card,

As featured in Ciarcia's Circuit Cellar, Byte Magazine, July, August, 1981.

\*In quantities of 100

```
001F EDBO
 01290
 LDIR
 istore screen to memory
 01300 ;
0021 006505
 01310 POSKIP
 LI
 L,(IX+PTRLSB)
 Froint HL to BASIC's
0024 DD3303
 01320
 LD
 H; (IX+PTRMSB)
 ; variables list
0027 46
 01330
 LD
 B, (HL)
 iset LENGTH of string
0028 23
 01340
 INC
 HL
0029 5E
 01350
 LI
 E, (HL)
002A 23
 01330
 INC
 HL
0028 56
 0.1370
 LI
 D;(HL)
0020 EB
 01380
 EX
 DE, HL
 ;HL => control characters
002 D DD 5301
 01390
 LI
 D,(TX+XPOS)
 ; DE register defines the
0030 DD5E03
 01400
 LI
 E, (IX+YPOS)
 ; current X,Y coordinates
 01410 #
0033 28
 DEC
 01420
 HL
 iset up for main loop
 01430 ;
0034 23
 01440 MAIN
 INC
 floor decodes each vector byte
0035 DD4E09
 C*(IX+SCALE)
 01450
 LI
 01460 7
0038 CB46
 01470
 BIT
 0, (HL)
 imotion NORTH?
003A 2803
 01480
 JR
 Z, CHKSTH
 thit not ON, so skip
003C 7B
 01490
 LI
 A,E
 thit is ON, adjust the
00311 91
 0.1500
 SUR
 C
 ; Y pointer NORTH by
003 III 5F
 01510
 |... I
 E,A
 ; the scaling factor
003F CB4E
 01520 CHKSTH
 BIT
 1, (HL)
 imotion SOUTH?
004 1 2803
 01530
 JR
 Z, CHKEST
01540
 LI
 A,E
0044 81
 01550
 ADD
 A,C
00455 5F
 01530
 LD
 E,A
004 & CB56
 01570 CHKEST
 BIT
 2,(HL)
 ;motion EAST?
0048 2803
 01580
 JR
 Z, CHKWST
004A 7A
 01590
 LI
 A,D
004E 81
 01600
 ADD
 A,C
004 C: 57
 01310
 LI
 II.A
004 D CRSE
 01620 CHKWST
 BIT
 3, (HL)
 imotion WEST?
004F 2803
 01630
 Z, CHKPLT
 JR.
0051 7A
 01640
 LD
 A, I
0052 91
 01650
 SUR
 С
0053 57
 01330
 LI
 II,A
0054 CBSE
 01670 CHKPLT
 BIT
 5, (HL)
 ;plot/no plot flag ON?
0056 2815
 01380
 JR
 Z, OKPLOT
 ;bit is OFF so PLOT
 01390
 ielse the following jump
 01700
 ;sends control looping
 01710
 ;back to set another
 01720
 ;control character
 01730 $
 01740 }-=-=-=-
0058 10DA
 01750 JMPER2 DJNZ
 ispan #2 of the "bridge"
 01760 }-=-=-=-=-
 01770 $
 01780 These lines "rage" the undated video storage area
 01790 #back IN to the screen. The action is skipped
 01800 twhen the resins arsument = 1 or 3 (bit 0 is ON).
 01810 #
005A DDCB0B46 01820 EXIT
 RIT
 O, (IX+PAGER)
 P_{3}(5) = 1 \text{ or } 3?
005E CO
 01830
 RET
 NZ
 ; then back to BASIC
 01840 #
005F FDE5
 01850
 PUSH
 ΙY
 page IN to screen
 ;else
0061 E1
 01860
 POP
 HL
 ;HL => storage
0062 110130
 01870
 LI
 DE,3C01H
0065 10
 01880
 DEC
 E
 ;DE => screen memory
```

# Now NRI takes you inside the new TRS-80 Model III microcomputer to train you at home as the new breed of computer specialist!

NRI teams up with Radio Shack advanced technology to teach you how to use, program and service state-of-the-art microcomputers...

It's no longer enough to be just a programmer or a technician. With microcomputers moving into the fabric of our lives (over 250,000 of the TRS-80™ alone have been sold), interdisciplinary skills are demanded. And NRI can prepare you with the first course of its kind, covering the complete world of the microcomputer.

#### Learn At Home in Your Spare Time

With NRI training, the programmer gains practical knowledge of hardware, enabling him to design simpler, more effective programs. And, with advanced programming skills, the technician can test and debug systems quickly and easily.



Training includes the TRS-80 Model III microcomputer, professional LCD multimeter, the NRI Discovery Lab, Computer Assisted Instruction programs and hundreds of demonstrations and experiments.

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

Only NRI gives you both kinds of training with the convenience of home study. No classroom pressures, no night school, no gasoline wasted. You learn at your convenience, at your own pace. Yet you're always backed by the NRI staff and your instructor, answering questions and giving you guidance.

#### You Get Your Own Computer to Learn On and Keep

NRI training is hands-on training with practical experiments and demonstrations. You don't just program your computer, you go inside it...watch how circuits interact...interface with other systems...gain a real insight into its nature.

You also work with an advanced liquid crystal display hand-held multimeter and the NRI Discovery Lab, performing over 60 separate experiments. Both microcomputer and equipment come as part of your training for you to use and keep.

#### Computer Assisted Instruction

Your TRS-80 even helps train you. You receive 8 special lesson tapes in BASIC computer language. Using them in your microcomputer, you "talk" to it as you progress. Errors are explained, graphics and animation drive home key points. Within a matter of minutes, you'll be able to write simple programs yourself.

#### Send for Free Catalog... No Salesman Will Call

Get all the details on this exciting course in NRI's free, 100-page catalog. It shows all equipment, lesson outlines, and facts on other electronics courses such as Electronic Design, Industrial Electronics, TV/Audio/Video Servicing... 11 different career opportunities in all. Keep up with the latest technology as you learn on the latest model of the world's most popular computer. If card has been used, write to:



#### NRI Schools

McGraw-Hill Continuing Education Center 3939 Wisconsin Avenue Washington, D.C. 20016

We'll give you tomorrow.

```
0044 01FF03
 01890
 LI
 BC,3FFH
0069 03
 01900
 INC
 RC.
 FRC is byte count (1024)
006A EDBO
 01910
 LDIE
 Frage memory to screen
 01920 $
0060 09
 01930
 RET
 #KKKKKK Program FXIT KKKKKKKK
 01940 $
 01950 #
006D C5
 01960 OKPŁOT
 PUSH
 RC
 save table bute counter
006E D5
 01970
 PUSH
 ΠE
 and current X,Y
 01980 #
 01990 #
 These nested loops draw a block of pixels (or
 02000 #
 characters) which is SCALE wide and SCALE high.
 02010 #
 02020 #

 02030 #
006F B5
 02040 YLOOP
 PUSH
 ΠE
 ‡
007 O DI 1430 9
 02050
 LI
 By(IX+SCALE)
 3
 ‡
 02030 #
 #
 02070 $

007/3 ES
 PUSH
 02080 XLOOP
 HL
 isave main resisters
 *
007.4 05
 PUSH
 02090
 RC.
 *
 02100 #
 ×
0075 DDZE0Z
 02110
 LI
 A, (IX+SRBYTE)
 fif 5th
 argument is *
0078 FE02
 CP
 02120
 2
 11 or 0, mode is PIXEL
007A 3823
 02130
 JR
 E , PXMODE
 02140 #
 This section determines a screen address
 02130
 $ *
 *
 02170 i* at entry : D = column position (0-63)
 *
 02180
 E = screen row
 *
 02190 i* at exit : HL => video memory at requested byte *
 destroys HL and BC registers
 02200
 $ X
 02210
 02220 #
007 C 7A
 02230 CHMODE
 LD
 A,II
 icheck XiY coordinates to make
007 D FE 4 0
 02240
 CP
 ; sure that they are valid
 54
007F 305C
0081 7B
 02250
 JR
 NC, PLTSKP
 for CHARACTER mode.
 02230
 LI
 A,E
0082 FE10
 02270
 CP
 13
0084 3057
 02280
 JR
 NC, PLTSKP
 02290 $
0086 63
 02300
 LI
 H,E
0087 6A
 I TI
 L , II
 get row and column
 02310
 02320
 SLA
0088 CB25
 L
008A CR25
 02330
 SLA
 L
 fcolumn = column * 4
008C CB2C
 02340
 SRA
 Н
008E CR1D
 02350
 RR
 L
0090 CB2C
 02360
 SRA
 Н
0092 CB1D
 jHL = HL/4
 02370
 RR
 L
0094 FDE5
 PUSH
 02380
 IY
0096 C1
 POP
 BC
 ;RC => storage
 02390
0097 09
 ### => byte to alter
 02400
 AUU
 HL, BC
0098 DD7E07
 iget plot character
 A, (IX+SRBYTE)
 02410
 LI
0098 183F
 02420
 JR
 SURYTE
 istore the CHARACTER arg.
 02430 #
 02440 ;-=-=-=-=-=-
 ispan #1 of the "bridge"
009 D 18B9
 02450 JMPER1
 JR
 JMPER2
 $-----
 02460
 02470 $
 02480 $
 Listing 1 continued on page 404
```

# Acalculated way to cut your electricity costs.

Saving on electricity costs is as easy as switching light bulbs. This *free* slide rule calculator from Westinghouse shows you where to begin.

Use your Westinghouse Energy-Saving Calculator to take a hard nosed look at the lamps you are using now. Your calculator will help you select the most efficient type of lamps for offices, plants, show rooms and display areas.

If you have fluorescents, substituting Westinghouse Econ-o-watt\* lamps for standard lamps will have an immediate effect of up to six watts per socket, with no appreciable change in light level.

Or save up to 80% in energy by replacing incandescent lighting with high pressure sodium lamps. They save energy while producing an equivalent

light level.

Westinghouse lamp products and programs are calculated to help save you from rising electricity costs. Our free calculator will show you how.

Get your free energy-saving calculator now! Call toll-free 800-631-1259.



```
02500
 ÷ *
 This is a relocatable SET/RESET routine:
 02510
 5 $
 At entry: D = X
 (0-127)
 *
 (0-47)
 02520
 Ε
 = Y
 ¥
 $ X
 0.2530
 5 %
 (IX+SRBYTE) = SET/RESET code (0 = RESET, 1 = SET)*
 0.2540
 郭
 destroys HL, BC, AF registers
 02550
 0.2530
009F 7A
 02570
 PXMODE
 LI
 A, II
 iskip if invalid coordinates
00AO FE80
 02580
 CP
 128
00A2 3039
 02590
 JR
 NC, PLTSKP
00A4 7B
 02600
 LI
 A,E
00A5 FE30
 CP
 02610
 48
00A7 3034
 02820
 JR
 NC, PLTSKP
 02630 #
00A9 26FF
 02640
 LI
 H, OFFH
00AB 7B
 02650
 LI
 A,E
00AC 24
 02660
 DIV3
 INC
 H
 idivide Y value by 3
00ATI B603
 02670
 SUB
 3
 fleaving auotient in H res.
00AF
 30FB
 02680
 NC, DIV3
 H is 0~15
 JR
 4
OB1 0603
 02690
 ADD
 A,3
 fand remainder in B res.
00B3 47
 02700
 LT
 B,A
 B is 0-2
 02710
00B4 6A
 LI
 L, I
00BS CB25
 02720
 SLA
 L
 iL = X * 2
00B7
 CB2C
 02730
 SRA
 H
OOB9 CB1D
 02740
 ER
 L
OOBB CB2C
 02750
 SRA
 н
 Divide HL by 4, leaving
OORD CRID
 02760
 RR
 L
 remainder (0 or 1) in Carry
OORF CRIO
 02770
 RL
 R
 idetermine rixel rosition by
00C J. 04
 02780
 INC
 R
 #B =DIV3 rmdr * 2 + DIV4 rmdr + 1
0002 AF
 02790
 XOR
 A
0003 37
 02800
 SCF
00C4 8F
 02810 GETRIT
 AIIC
 A,A
 idetermine rixel value by
00CS 10FD
 02820
 IMNZ
 f taking 2 to the Rth
 GETRIT
 FOWER
 02830 #
0007 FDE5
 02840
 PUSH
 IY
0009 01
 POP
 02850
 BC
000A 09
 02860
 AIII
 HL, BC
 #HL => byte to alter
 02870
 7
OOCH CR7E
 RIT
 02880
 7; (HL)
 icheck if currently
00CH 2002
 02890
 JR
 NZ, GFXOK
 graphics, so if so
000F 3880
 02900
 LI
 (HL),80H
 else clear the bute
00D1 DDCB0746
 02910 GFX0K
 BIT
 O, (IX+SRRYTE)
 if SET/RESET flag is 0
00DS 2803
 02720
 JR
 Z, RESET
 then skir else
00D7 B6
 02930 SET
 OR
 (HL)
 jadd a bit to screen byte
0008 1802
 02940
 JR
 SVRYTE
00DA 2F
 02950 RESET
 CFL.
 02960
OODE A6
 AND
 (HL)
 imask bit from byte
 02970
00DC 77
 02980 SVBYTE
 LI
 (HL),A
 istore the altered byte
 02990
OOLU C1
 03000 PLTSKP
 POP
 BC
 frestore registers used by
OODE EL
 03010
 POP
 HL
 Flot routines
 03020
 7
 *:
 ĝ '
00DF 14
 03030
 INC
 II
 ¥
00EO 1091
 03040
 IIJNZ
 XL00F
 fplot SCALE horizontal points*
 03050
 4
 #
 03060

 ŧ
 03070
 ŧ
00E2 B1
 03080
 POP
 ΠE
 7
 ŧ
```

Find great bargains in this list and reap the rewards: immediate availability, 24-hour express delivery, toll-free technical support, 60-day trial with full refund privileges and special volume discounts.

#### DATABASE MANAGEMENT

dBase II-

Ashton-Tate \$ 475

Condor II-Condor

Computer Corp. \$ 450 Data Star-MicroPro

Call For Price

Easy Filer-

LU.S. \$ 280

VisiFile-VisiCorp \$ 190

#### SPREADSHEETS/ **CALCULATORS**

SuperCalc-Sorcim

Call For Price

VisiCalc 256K-

\$ 195 VisiCorp

Calc Star-MicroPro Call For Price

Multiplan-

Micro Soft \$ 225

Help in reducing our inventory. Pick up one of these specials—priced so low we're actually losing money!

#### HAYES SMARTMODEM 1200

(in stock) \$525

CROSSTALK

MicroStuf \$120 dBASE II

Ashton-Tate

\$475

SUPERCALC

Call For Price Sorcim

#### WORDMATES (IBM PC)

From Softword Systems the professional's choice in IBM PC word processing.

LANGUAGES/ UTILITIES

C Basic-Digital

Research \$ 125 M Basic-

Micro Soft CB 80-

Digital

Research \$ 420 Basic Compiler-

Micro Soft

\$ 310 Fortran 80-

Micro Soft 395

CoBol 80-

Micro Soft

Pascal MT+-

Digital

Research \$ 425

PL-1 80-Digital Research

\$ 420

245

395 \$ 245

\$ 575

\$ 275

#### **COMMUNICATIONS**

| Emulink (IBM PC 3270) |
|-----------------------|
| Micro Link Corp       |
| Emulink (Apple 3270)  |
| Micro Link Corp       |
| Crosstalk-Micro Stuf  |
| BSTAM-Byron Software  |

\$ 995

795 \$ 120

\$ 150

\$ 395

StatPak-NW Analytical

Software

VisiSchedule-VisiCorp VisiTrend/Plot-VisiCorp Supersort-MicroPro

Datebook-Organic Software

**MISCELLANEOUS** Milestone-Organic

\$495

\$ 245 Call For Price \$ 245

#### WORD PROCESSING/SPELLING

| WOLED I TEO CHENTING OF HE       |                |
|----------------------------------|----------------|
| Wordmate-Softword Systems        | \$ 495         |
| Wordstar-MicroPro                | Call For Price |
| Mailmerge-MicroPro               | Call For Price |
| Wordstar/Mailmerge-              |                |
| MicroPro                         | Call For Price |
| Spellbinder-Lexisoft             | \$ 295         |
| Easywriter II-I.U.S.             | \$ 265         |
| The Final Word-Mark of the Uni-  | corn \$ 245    |
| Select w/Superspell-Select Info. |                |

Sytems

#### MODERNO

| MODEMS               |        |
|----------------------|--------|
| Hayes Micromodem II  | \$ 275 |
| Hayes Smartmodem 300 | \$ 212 |
|                      |        |

| PRINIERS          |        |
|-------------------|--------|
| Epson MX80 FT     | \$ 555 |
| Epson MX100 FT    | \$ 745 |
| IDS Prism 80      | \$1335 |
| Okidata 82A       | \$ 439 |
| Okidata 83A       | \$ 705 |
| NEC 3550 33cps wp | \$1900 |
|                   |        |

#### Call toll-free 800-328-2260

(In Minnesota, 612-544-3615)

American Express • MasterCard • VISA

3.5% surcharge on all credit orders.

Purchase orders accepted from corporate accounts. All orders are shipped UPS. 3% shipping charge on software items. 2% shipping charge on hardware items.

#### DATASOURCE DATASOURCE SYSTEMS MARKETING CORP.

1660 South Highway 100, Minneapolis, MN 55416

Circle 141 on inquiry card.

```
ŝ
 E.
00E3 10
 03090
 INC
00E4 OD
 03100
 IIFC.
 C
 *
00E5 2088
 JK
 NZ, YLOOF;
 plot SCALE vertical points
 03110
 03120
 5

 03130 $
 03140 7
 F'OF'
 IIE.
 frestore current X,Y
00E7 B1
 03150
00E8 C1
 03160
 FOF
 RC.
 ; and share table counter
 JMPER1
 iso to MAIN via JUMPERS
00E9 18B2
 JR
 03170
 END
0000
 03180
00000 TOTAL ERRORS
25739
 TEXT AREA BYTES LEFT
 01530
CHKEST 0046 01570
CHKPLT 0054 01670
 01.630
CHKSTH 003F 01520
 01480
CHKWST 004D 01620
 01580
CHMODE 0070 02230
HIV3
 00AC 02660
 02680
 005A 01820
EXIT
GETRIT 0004 02810
 02820
 0001 02910
 02890
GEXOK
JMPER1 009B 02450
 03170
JMPER2 0058 01750
 02450
 0034 01440
 01750
MAIN
OKPLOT 006D 01960
 01680
PAGER
 0000 01000
 01210 01820
 02250 02280 02590 02620
PLISKE OODD 03000
POSKIP 0021 01310
 01220
PTRLSB 0005 00960
 01310
PIRMSB 0006
 00970
 01320
PYMODE OOSE
 02570
 02130
RESET
 00DA 02950
 02920
 00990
 01450 02050
 0009
SCALE
SET
 00107
 02930
 02110 02410 02910
SRRYTE 0007
 00980
 02420 02940
SUBYTE CODE 02980
XLOOP.
 0073 02080
 03040
 00740
 01390
XPOS.
 0001
 03110
 02040
YLOOP
 006F
YPOS
 0003 00950
 01400
```

ŧ

#

Listing 2: KWIKDRAW BASIC-language program. The assembly-language programming from listing 1 has been incorporated into the DATA statements in lines 500-670. This data will be packed into line 20. Lines 10-50 may then be used as a kernel for your own BASIC programs.

#### 5 KWIKDRAW machine language shape drawing program by DAN ROLLINS 11/10/81

\* \* \* 6

- \*\* This program sets up the machine language program
- After a successful RUN, for use as a USR routine.
- RUN again for a simple demonstration.

Listing 2 continued on page 408



#### FORMULA INTERNATIONAL INC.

12603 Crenshaw Blvd., Hawthorne, CA 90250 For information (213) 973-1921 • Orders Only (outside Calif.) (800) 672-8758



# ineapple

#### The Alternative! The Compatible! The Affordable! 48K Color Computer Kit!

#### **FEATURES:**

- ★ Singleboard for easy assembly
- ★ Popular 6502 MPU for large amount of software
- ★ Game paddle connector on both ★ 14 key numeric key-pad sides of case
- ★ Fully compatible with Apple® II+ ★ Built in 2-watt amplifier for realistic sound effect with volume control
  - ★ 8 on board peripheral connectors for expansion

  - ★ 5-amp switching power supply

Easy to assemble! All components are clearly silk-screened on the high quality double-sided mother board. All integrated circuits, IC sockets, peripheral connectors, keyboard, switching power supply and the professional high impact plastic case are included.

(please add 5% shipping and handling)

#### High Quality 16K RAM Card Kit

(no cable required)

Same feature as the one we've been selling but without the mess of Dip-wire for Apple® & Pineapple™. **\$59.95** per kit

#### 51/4" Flexible Disc Sale

Why buy other brands when you can buy WABASH discs for much less and backed by 1-year factory warranty. All discs come with Hub Rings

| M13A411X   | 51/4" SSDD Soft Sector       | \$2.25 |       |
|------------|------------------------------|--------|-------|
| M43A411X   | 51/2" SSDD 10 Hard Sector    | \$2.25 | 10-99 |
| M53A411X   | 5¼" SSDD 16 Hard Sector      | \$2.25 |       |
| * M14A411X | 51/4" DSDD Soft Sector       | \$3.65 |       |
| F111111X   | 8" SSSD IBM compatible       | \$2.45 |       |
| F131211X   | 8" SSDD 26 sectors 128 bytes | \$3.05 |       |

#### At last! Here's the computer case everyone has been looking for!

Ideal for your homebrew

\*AP-II 6502 MPU based computer. Made with high impact plastic. Color and shape are compatible with the standard Apple II computers.

Introductory Offer \$150.00 ea.

Keyboard not included see our Ad in this page.

MODEL: AP-II

\*AP-II model is compatible with Apple II but not manufactured by Apple Computers, Inc. @Apple or Apple II is a registered trade mark of Apple Computers, Inc.

#### 6502 MPU Based Computer Motherboard! You ask for it, you got it!

- ★ 48K on board memory (4116)
- 12K on board EPROM memory (2716 or 2732)
- ★ 8 expansion slots for peripheral cards
- ★ Composite-video output
- ★ size: 141/4" × 81/2"



\$99.95 ea.

#### 16K RAM Card Kit For Your Apple® & Pineapple™ Computer



Kit includes:

• High Quality P.C. Board • 8 ea. 4116 (200ns) • All the IC's & parts • 16-pin Dip wire • Easy to assemble. You can do it in less than 30 minutes! **\$49.95** per kit

#### 5¼" Disc Drive 100% Apple® & Pineapple™ Compatible



We did it once, response was great! Now we are doing it again, don't miss it!

\$295.00 ea. w/o controller \$385.00 ea w/controller

#### Replacement Keyboard For Your Apple® II Computer

Got a bad Keyboard? Here's the alternative!

- ★ Full ASCII code
- ★ N-key rollover function
- ★ TTL level output
- ◆ On-Off indicator.
- ★ Low power consumption
- ★ With upper/lower case function



\$99.95 ea.

#### **Switching Power Supply For** Apple®, AP-II, and Pineapple Computer

Compact size switching power supply.

|                | - · · · · · · · · · · · · · · · · · · · |      |
|----------------|-----------------------------------------|------|
| Specification: | 4006A                                   | 4007 |
| +5V at         | 3 <b>A</b>                              | 5A   |
| -5V at         | 2A                                      | 3A   |
| +12V at        | .5A                                     | 1A   |
| -12V at        | .5A                                     | 1A   |



4006A . . . . . **\$99.00** ea.

Size: Width 31/2", Depth 93/4", Height 21/4"

Size and mounting holes will be same as the one used in Apple II.

Apple is a registered trademark of APPLE COMPUTERS. INC.

nci. Mexico & Cenede



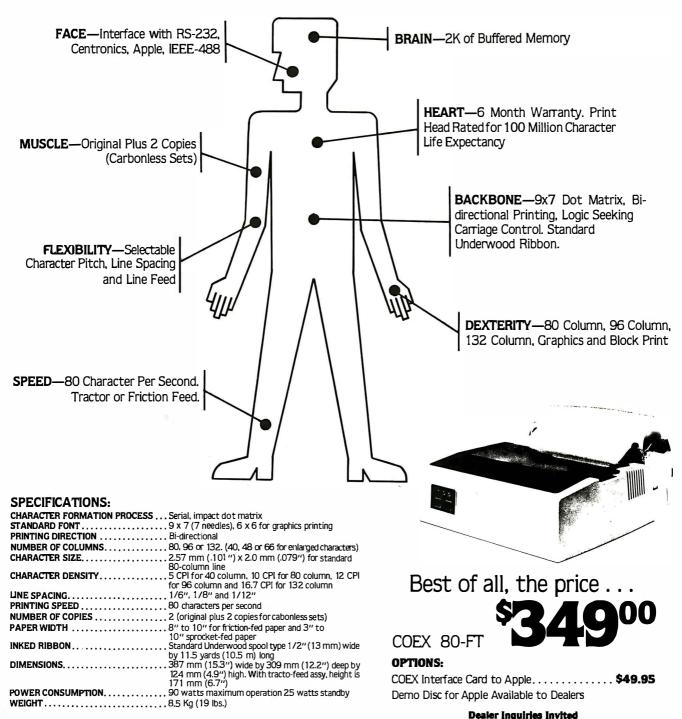
STORE HOURS MON-FRI — 10-7

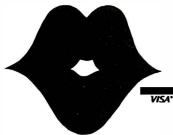
Circle 174 on inquiry card.

```
10 CLEAR 2000 :DIM P%(517) :CLS '* parameter & screen storage
20 KD$="-----234 or more dashes-----
30 V=VARPTR(KD$)
40 POKE 16526, PEEK(V+1) : POKE 16527, PEEK(V+2)
50 DEFUSR0=PEEK(V+1)+PEEK(V+2)*256 '* non-disk omit this line
99 '**
 ** This code reads the DATA lines and pokes the op codes
 ** into the dummy$ --KD$-- on line 20
100 ADDR=PEEK(V+1)+PEEK(V+2)*256
 '* starting address
110 IF LEN(KD$)<234 THEN CLS :PRINT "KD$ IS TOO SHORT" :EDIT 20
120 CLS :PRINT@ 975, "CODE IS BEING POKED INTO KD$"; :PRINT@ 0,;
130 READ A$: IF · A$="END" THEN 200
140
 B$=LEFT$(A$,1) :C$=RIGHT$(A$,1)
150
 M=ASC(B\$)-48+(B\$>"9")*7: L=ASC(C$)-48+(C$>"9")*7
 '* calculate checksum
160
 CS=CS+M+L
 '* display each byte
 PRINT A$;" ";
170
 POKE ADDR, M*16+L : ADDR=ADDR+1
 '* store an op code
190 GOTO 130
200 IF CS = 3330 THEN PRINT "*SUCCESSFUL* ";
 ELSE PRINT "** BAD DATA **" :STOP
210
 '** delete unwanted lines
 DELETE 99-670
500 DATA CD, 7F, 0A, E5, DD, E1, DD, 2B, 11, 0C, 01, 15, 19, E5, FD, E1
510 DATA DD,CB,0B,4E,20,0B,EB,21,01,3C,2B,01,FF,03,03,ED
520 DATA B0,DD,6E,05,DD,66,06,46,23,5E,23,56,EB,DD,56,01
530 DATA DD,5E,03,2B,23,DD,4E,09,CB,46,28,03,7B,91,5F,CB
550 DATA 4E,28,03,7B,81,5F,CB,56,28,03,7A,81,57,CB,5E,28
560 DATA 03,7A,91,57,CB,6E,28,15,10,DA,DD,CB,0B,46,C0,FD
570 DATA E5,E1,11,01,3C,1D,01,FF,03,03,ED,B0,C9,C5,D5,D5
580 DATA DD, 46,09,E5,C5,DD,7E,07,FE,02,38,23,7A,FE,40,30
590 '
600 DATA 5C,7B,FE,10,30,57,63,6A,CB,25,CB,25,CB,2C,CB,1D
610 DATA CB, 2C, CB, 1D, FD, E5, C1, 09, DD, 7E, 07, 18, 3F, 18, B9, 7A
620 DATA FE,80,30,39,7B,FE,30,30,34,26,FF,7B,24,D6,03,30
630 DATA FB,C6,03,47,6A,CB,25,CB,2C,CB,1D,CB,2C,CB,1D,CB
640 '
650 DATA 10,04,AF,37,8F,10,FD,FD,E5,C1,09,CB,7E,20,02,36
660 DATA 80, DD, CB, 07, 46, 28, 03, B6, 18, 02, 2F, A6, 77, C1, E1, 14
670 DATA 10,91,D1,1C,0D,20,88,D1,C1,18,B2,END
799 1 **
 ** This demonstrates the drawing and scaling
 ** features of KWIKDRAW
 **
800 FS$="IDDDFJHHHI"
810 M$(1)="D" : M$(2)="4D" : M$(3)="44D" : M$(4)="444D"
 '** coordinates for shape
820 X=63 :Y=23
 '** draw with LIT pixels
830 SR=1
 '** scale at minimum
840 SC=1
 '** page OUT and IN
850 PG=0
```

#### The COEX

# **Anatomy of a Printer**





"Have You Kissed Your Computer Lately"

## Components Express, Inc.

1380 E. Edinger ● Santa Ana, Calif. 92705 ● 714/558-3972 Terms of Sale: Cash, Checks, Credit Cards, M.O., C.O.D. Calif. residents add 6% sales tax.



```
860 XD=-1 :YD=-1 :SD=1 '** X,Y and scale directions
870 M=M+1 : IF M>4 THEN M=1
880
 A\$=FS\$+M\$(M)
890
 '** draw the shape
 GOSUB 1000
 SC=SC+SD*.4 : IF SC<1 OR SC>7 THEN SD=-SD :GOTO 900
900
910
 X=X+XD*SC : IF X<-10 OR X>137 THEN XD=-XD : GOTO 910
920
 Y=Y+YD*SC: IF Y<-5 OR Y>52 THEN YD=-YD: GOTO 920
 FOR DELAY=1 TO 100 :NEXT
930
940 CLS :GOTO 870
997 '**
 Routine draws a predefined figure.
 On entry:
 X and Y screen coordinates
 holds shape characters
 Α$
 SR
 is SET/RESET/CHARACTER byte:
998 '*
 0 = draw with RESET pixels
 l = draw with SET pixels
 else = CHARACTER for drawing
 SC
 is scaling factor
 PG
 is paging instruction:
999
 0 = page OUT, draw, page IN
 l = page OUT, draw
 2 = draw, page IN
 * *
 3 = draw only
1000 P%(0)=X : P%(1)=Y : P%(2)=VARPTR(A$)
 :P%(3)=SR :P%(4)=SC :P%(5)=PG
1010 UU=USR0(VARPTR(P%(0)))
1020 RETURN
```



bookstore! Not available at any price! The new Consumer Information Catalog!

It's the free booklet that lists over 200 helpful Federal publications; more than half, free. On topics like home repairs. Money management. Nutrition. Informabetter way of life.

To get your free copy, just write:

> CONSUMER INFORMATION CENTER, DEPT.E PUEBLO, COLORADO 81009

General Services Administration.

#### FREE SHIPPING

#### **IBM®** Personal Computer Products

Davong 5 MB Hard Disk System 12 MB Hard Disk System 2099.00 IBM PC-2 Drive System \$CALL

#### Quadram - Quadboard with Parallel

Port, Serial Port, Clock/Calendar,
Expandable to 256 K.
64 K on brd. \$425.00
128 K on brd. 539.00
192 K on brd. 629.00
256 K on brd. 719.00

#### Quadram Memory Expansion

| \$230.00 |
|----------|
| 350.00   |
| 490.00   |
|          |

#### **Amdek Monitors**

| Mod. 300 Phosphor           | \$150.00 |
|-----------------------------|----------|
| Composite Color III         | 345.00   |
| IBM RGB Compatible Color II | 650.00   |
| Color I                     | 300.00   |

#### IBM/TRS 80 Disk Drives/Cabinets

| TM 100-1 Single 40 Track Drive           | \$189.00 |
|------------------------------------------|----------|
| with Cabinet & P/S                       | 235.00   |
| TM 100-2 Double 40 Track Drive           | 289.00   |
| TM 100-3 Single 80 Track Drive           | 289.00   |
| TM 100-4 Double 80 Track Drive           | 379.00   |
| 8" Dual Slim Line Power Supply & Cabinet | 225.00   |
| 5¼ External Power Supply & Cabinet       | 49.00    |
|                                          |          |

VISA, MASTERCARD (\$100 Min. Add 2%) Or Certified Check

90 Day Warranty (Parts & Labor) TRS 80 is a Registered Trademark Tandy Corp. Prices Subject to Change Without Notice

#### **Apple II® Computer Products**

| Apple Compatible Controller Card              | \$79.95 |
|-----------------------------------------------|---------|
| Apple Compatible Disk Drive w/Cabinet & Cable | 265.00  |
| w/Controller                                  | 325.00  |
| 16 K Ram Card                                 | 60.00   |
| Printer/Graphics Interface                    | 99.95   |
| Davong 5 MB Hard Disk System                  | 1525.00 |
| Davong 12 MB Hard Disk System                 | 2099.00 |
| Apple Compatible Joysticks                    | 42.95   |



### **Epson/Smith-Corona Printers**

| MX80                                         | \$425.00 |
|----------------------------------------------|----------|
| MX80 F/T                                     | 470.00   |
| MX100                                        | 640.00   |
| Smith Corona TP-1 Letter Quality Daisy Wheel | 565.00   |
| TRS 80 / IBM Parallel Printer Cable          | 20.00    |
| (with purchase of printer)                   |          |
| STAR MICRONICS GEMINI 10                     | 399.00   |
| GEMINI 15                                    | 499.00   |



#### Our TRS 80® Mod III

48 K; 2 Tandon 5¼ Disk Drives w/ RS 232.. **\$1700.00** 

#### **Memory & Media**

| ommodore VIC-64               | <b>\$Call</b>     |
|-------------------------------|-------------------|
| MD2 - D/S - D/D               | 46.00/Box of 10   |
| MD1 - S/S - D/D               | \$36.00/Box of 10 |
| Maxell Diskettes              |                   |
| 16 K Upgrade Kit (4116)       | 12.95             |
| IBM 64 K Upgrade Kit (9-4164) | \$79.95           |
|                               |                   |

DATA MAIL

1-(800) 635-5555

P.O. BOX 818, RESEDA, CA 91335

FREE SHIPPING IN CONTINENTAL U.S. (TRS 80 MOD III EXCEPTED)

(213) 993-4804

Circle 211 on inquiry card.



SA2 ROBOT

\$1495

The SA2 is a robot developed for the educational market, and has been designed to meet a requirement for a robot which will emulate, in behaviour and physical attributes, larger industrial robots.

The arm can access 360°, with a read of 18 inches and a maximum lift of 1/2 lb.

Circle 212 on inquiry card.

#### The Syntheasy

A low cost speech unit complete with Votrax speech output chip, unlimited vocabulary, power supply, speaker and case, all for only-

\$149.95



DEALER INQUIRIES INVITED For further information contact

#### INTELLIGENT ARTEFACTS LTD.

19205 Parthenia St., Suite H Northridge, CA 91324 Tel (213) 993-4803

```
5 '**
 **
 CREATE
 **
 This program is used in generating a
 **
 shape definition string for display by
 **
 KWIKDRAW
 **
 by Dan Rollins
 * *
10 CLS: INPUT "Need instructions"; O$: IF O$="Y": GOSUB 9000
15 CLEAR 2000 : DEFINT A-Z : DIM V(255)
 '** valid command keys
20 CK$=" /SCIDHLXAM"+CHR$(13)
25 VK$="123456789!"+CHR$(34)+"#$%&'()0" '** valid vector keys
30 CL$=CHR$(30) :I=1
35 IM$="X:### Y:## offsets:#### ### @:#### P:### len:###"
40 FOR J=1 TO 9 :READ A$,DX(J),DY(J) :CH(J)=ASC(A$) :NEXT
45 DATA J,-1, 1,
50 DATA D, 1, 0,
 B, 0, 1, F, 1, 1,
 H,-1, 0,
 I,-1,-1,
 A, 0, -1,
 Ε,
 1,-1
55 INPUT"coordinates for model (X,Y--defaults: 30,10)";X1,Y1
60 INPUT"coordinates for working shape (defaults: 30,30)";X2,Y2
65 PRINT :PRINT"String literal to edit or <ENTER> to start anew"
70 PRINT :SHAPE$="C" :INPUT SHAPE$
75 IF SHAPE$="" GOTO 85
80 FOR J=1 TO LEN(SHAPE$): V(J)=ASC(MID$(SHAPES$,J,1)): NEXT
85 LAST=LEN(SHAPE$) :X1=30 :Y1=10 :X2=30 :Y2=30
90 PTR=0 :GOSUB 700 :GOSUB 800
 '** start in EXTEND mode
95 '**
 ** main loop interprets commands, displays data
 **
100 PRINT@ 0, "COMMAND: ";
105 PRINT USING IM$; X,Y,X-X2,Y-Y2,INT(X/2)+INT(Y/3)*64,PTR,LAST;
110 GOSUB 1000 :GOSUB 3000 :IF K2=0 THEN 100
115 ON K2. GOSUB 200, 250, 300, 400, 500, 600, 650, 700, 800, 75, 10000
120 IF K2=12 GOTO 6000
125 GOTO 100
199 '**
 ** routine moves the cursor forward
 <spacebar>
200 IF PTR=LAST THEN RETURN
210 PTR=PTR+1 :V=V(PTR) :GOSUB 4000
220 IF V AND 64 THEN SET(X,Y)
230 RETURN
240 '**
 ** back up cursor
 </>
 * *
250 IF PTR<1 THEN RETURN
260 V=V(PTR) : IF V AND 64 THEN RESET(X,Y)
 '** invert all bits to back up
270 V=NOT V(PTR) AND 15
280 GOSUB 4000 :PTR=PTR-1 :RETURN
290 '**
 ** Search for a vector
 <S>
 * *
300 PRINT@ 0,"search vector?";CL$;
310 GOSUB 1000 :GOSUB 2000 :IF K1=0 GOTO 310
320 IF Kl=10 THEN RETURN
330 V1=V :PTR=PTR+1 :GOTO 350
340 PTR=PTR+1 :V=V(PTR) :IF V=V1 THEN PTR=PTR-1 :RETURN
350 GOSUB 4000 : IF V AND 64 THEN SET(X,Y)
360 IF PTR=LAST THEN RETURN
```

# RadioShackTRS-80





YOU CAN SAVE money when you buy Radio Shack TRS-80 Computers from Pan American Electronics. Pan American Electronics went into business in 1976 and led the way in bringing consumers original Radio Shack TRS-80 Computers at reduced prices. NO other company has done it longer.

NO other company has done it better and NO other company sells them for less.

#### **Pan American Electronics**

#### **TOLL FREE NUMBER 800/531-7466**

1117 Conway Avenue • Department B Mission, Texas 78572 Phone: 512/581-2766 Telex Number 767339

TM — Trademark of Tandy Corporation

#### Micro Power Bench



- Single Switch Control of CPU and Peripherals
- Built in circuit breaker protects your system
- Four power expansion outlets
- Optional power surge protection (\$39)
- Optional vent fan (\$39)
- Compatible with IBM, APPLE, TRS-80 and others



Dealer or ordering info.

800-343-4311

CAB-TEK, Inc.

Riverside St., Nashua NH 03062 CIVILIZING COMPUTERS

ACOUSTIC ENCLOSURE \$99!

DEALER INQUIRIES INVITED

#### MAGIC PRINT

o0o How Magic Is MagicPrint™? Lifeboat Associates proportionally-spaced,

Roses R Red Violets are Blue Our MagicPrint offers Multiple column printing

professional text formatter? And page footnotes too!!! ...True, you love your high quality daisywheel printer... Its sleek lines, power, speed ... but do you make use Of all its abilities such as true proportional printing boldface, underline, double-strike, over-strike, single character kerning and micro centering, accenting and other goodies -- fifty+ in all. Magic Print works with most any text editor or word processing program. Features include: \*multiple line page headers and footers \*print line left or right or centered \*line-by-line trapping of errors \*hanging indents and outdents \*multiple column capability And for WordStar™ users proportional printing using WS commands! For Magic Print Call Lifeboat \$195 retail, deals for

Lifeboat

dealers too

The Standard For Fully Supported Software

1651 Third Avenue, N.Y., N.Y. 10028 (212) 860-0300 TWX: 710-581-2524 (LBSOFT NYK) • Telex: 640693 (LBSOFT NYK)

Copyright ©1982, by Lifeboat Associa WordStar is a TM of MicroPro. Magic Print is a TM of Editype Sys. Circle 231 on inquiry card.

```
370 GOTO 340
390 '**
 ** Change a single vector at cursor
 <C>
400 IF PTR=LAST RETURN
410 PRINT@ 0, "vector to change?"; CL$;
420 GOSUB 10.00 :GOSUB 2000 :IF K1=0 GOTO 420
430 IF Kl=10 THEN RETURN
440 V(PTR+1)=V :GOSUB 200
450 RETURN
490 '**
 <I>
 ** Insert a single vector
500 PRINT@ 0, "vector to Insert?"; CL$
510 GOSUB 1000 :GOSUB 2000 :IF K1=0 GOTO 510
520 IF Kl=10 THEN RETURN
530 FOR J=LAST TO PTR+1 STEP-1
540
 V(J+1)=V(J)
550 NEXT :LAST=LAST+1
560 \text{ V(PTR+1)=V}
570 GOSUB 4000 : IF V AND 64 THEN SET(X,Y)
580 PTR=PTR+1 : RETURN
590 '**
 ** Delete a single vector
 <D>
600 IF PTR=LAST THEN RETURN
610 PRINT@ 0, "Deleting a vector"; CL$;
620 FOR J=1 TO 300 :NEXT
630 FOR J=PTR+1 TO LAST :V(J)=V(J+1)
640 NEXT :LAST=LAST-1 :RETURN
645 '**
 ** Hack off line & extend
 <H>
650 PRINT@0, "Hacking from cursor on"; CL$
660 FOR DELAY=1 TO 300 :NEXT
670 LAST=PTR :GOTO 800
690 '**
 <L>
 ** List (draw) entire figure
700 CLS : X=X1 : Y=Y1
710 FOR J=1 TO LAST
720
 V=V(J) :GOSUB 4000
730
 IF V AND 64 THEN SET(X,Y)
740 NEXT
750 PTR=0 :X=X2 :Y=Y2
760 RETURN
790 '**
 ** Extend the shape
 < X >
800 IF PTR=LAST GOTO 840
810 FOR J=PTR TO LAST :V=V(J)
 GOSUB 4000 : IF V AND 64 THEN SET(X,Y)
820
830 NEXT : PTR=LAST
840 PRINT@ 0,"EXTEND: (0 for COMMAND) X:";
 PRINT X; " Y: "; Y; " len: "; LAST; CL$;
850
860
 GOSUB 1000 :GOSUB 2000 : IF K1=0 THEN 860
870
 IF K1=10 THEN RETURN
 PTR=PTR+1 :LAST=PTR :V(PTR)=V
880
 GOSUB 4000 : IF V AND 64 THEN SET(X,Y)
890
900 GOTO 840
990 '**
 Listing 3 continued on page 416
```

QUALITY **ACTIVE, YOUR SERVICE NUMBER ONE** CHOICE **AVAILABILITY** videst variety of factory xtensive Product Offerin computer Boards/Microprocessor and Support Circuits/Transistors. Diodes. Capacitors, Resistors, Optoelectronics
Porentiometers, Relays, Multimeters,
Switches, Knobs, Connectors, Sockets, P.C.
Boards, Enclosures, Data and Reference
Books, Soldering Aids, AND MUCH MORE Superior Service Greater choice. Easier faster ordering and more reliable deliveries. Active's all NEW comprehensive
Fall/Winter catalog is now available — FREE OF
CHARGE. Circle No. 6 on free information cald or
write to:P.O. Box 8000, Westboro, MASS 01581U.S.A.

Call Toll Free 800-343-0874

MASS. customers call (617) 366-0500

From Computer Plus to YOU ...

#### PLUS after PLUS after PLUS













#### BUY DIRECT Here are just a few of our fine offers ...

| COMPUTERS                   |        | R.S. Modem I.D.C.           | 130  | DISK DRIVES                                        |             |
|-----------------------------|--------|-----------------------------|------|----------------------------------------------------|-------------|
| Model II64K                 | \$2675 | R.S. Modern II D.C          | 210  | R.S. Model III1ST-Drive                            | 650         |
| Model III 4K LEV I          | 599    | Signalman Modem             | 89   | Igndon 40 Track MI                                 | 289         |
| MODELIII16K                 | 799    | PRINTERS                    |      | Color Computer Drive 1                             |             |
| MODELIII48K                 | 864    | Daisy Wheel II              | 1715 | Color Computer Drive 0                             | 299         |
| Modellii48K                 |        | DWP-410                     | 1335 | Primary Hard Disk MII                              | 470<br>3899 |
| 2 Disk & RS232 c            | 1899   | Smith Corona IPIDaisy Wheel |      | Primary Hard Disk Mill                             | 1999        |
| Color Computer 16K          | 235    | EpsonMX80                   | 499  | ETC.                                               | 1999        |
| Color Computer 16K          |        | EpsonMX80FT                 | 549  | CCR-81 recorder                                    |             |
| w/extended basic            | 305    | Epson MX100                 | 735  |                                                    | 52          |
| tColor Computer 32K-64K     | 000    | CGP-115                     | 199  | C. C Joysticks 16K RAM N E C. 200 N S. chips       | 22          |
| w/extended basic            | 420    | DMP-100                     | 315  | 64K Ram Chips                                      | 25          |
| Pocket Computer 2           | 230    | DMP-200                     | 599  |                                                    | 75          |
| Model 16 1DR 128K           | 4199   | DMP-400                     | 1029 | Color Computer Flex D O S<br>8rond Name Software • | 99          |
| Model 162DR 128K            | 4799   | DMP-500                     | 1569 |                                                    |             |
| DT-1 Data Terminal          | 599    | Okidata 80                  | 320  | Send for fisting.                                  |             |
| PT-210 Portable Terminal    | 779    | Okidata 82A                 |      | R.S. Software 10% off list                         |             |
| MODEMS                      | •••    | Okidata 83A                 | 399  | 1Colo/Computer 64K requires                        |             |
| Lynx Direct Connect MI/MIII | 235    | Okidala 84 Parallel         | 655  | DiskBand DOS                                       |             |
| Hayes Smart Modern II       | 235    |                             | 666  | 01710 0110 0 0 0                                   |             |
| Haves Smart Modern 1200     | 599    | Okidata92                   | 510  |                                                    |             |
| R.S. Acoustic Coupler AC-3  | 134    | Okidala93                   | 859  |                                                    |             |
| k.s. Acoustic Couplet AC-3  | 134    | P. C. Plotter Printer       | 199  |                                                    |             |

Circle 108 on inquiry card. We have the lowest possible Fully Warranteed Prices AND a full complement of Radio Shack Software.

Prices subject to change without notice Not responsible for typographical error TREAD is a realistered trademark of Tandy Cor



TOLL FREE 1-800-343-8124

#### 

Brand New, Top Quality, Exact Replacement Ribbons & Cartridges. These Ribbons Produce Super Jet Black Impressions and Ultra Reliable Print Life. They Are Delivered to Your Door Promptly for Much Less Than Most Retail Stores

#### ★SPECIAL! BUY 10 and GET ONE FREE!

| YOUR PRINTER                  | PACKSIZE | RETAIL LIST** | YOUR WHOLESA           | ALE PRICE  | SIZE         | COMMENTS          | CAT. DROER# |
|-------------------------------|----------|---------------|------------------------|------------|--------------|-------------------|-------------|
| ANADEX 9000 Series            | 1/pk     | 14.00 ea      | 14.00                  | (14.00 ea) | 500"         | Nylon Jet Blk     | C-777       |
| CENTRONICS 700-703, 737, 779  |          | 18.95/3 pk    | 11.95/3 pk             | (3.98 ea)  | .563" x 45"  | Nylon Jet Blk     | C-700       |
| CENTRONICS 100, 101A, 102,    | 3/pk     | 26.33/3 pk    | 17.55/3 pk             | (5.85 ea)  | 1" x 108"    | Nylon Jet Blk     | C-100       |
| 103, 300, 301, 306, 308, 330, |          |               |                        |            |              | 5 mil High Speed  |             |
| 358. 398, 500, 501, 503, 508, |          |               |                        |            |              |                   |             |
| 588, 620, 820.                |          |               |                        |            |              |                   |             |
| CENTRONICS 704-705            | 1/pk     | 16.95 ea      | 13.95/Giant Cart       | (13.95 ea) | 5/16" x 210" | Giant Cart        | C-7045      |
| DEC 1/2 x 40YO.               | 3/pk     | 17.77/3 pk    | 12.95/3 pk             | (4.32 ea)  | 1/2" x 120"  | Double Spools     | R-600       |
| DEC 1/2 x 60YO.               | 3, pk    | 20.12/3 pk    | 14.25/3 pk             | (4.75 ea)  | 1/2" x 180"  | Double Spools     | R-644       |
| DIABLO HYTYPE II (M/S BLK) HI | 1/pk     | 9.31 ea       | 6.87 ea                | (6.87 ea)  | 5/16'' x     | 300,000 plus imp. | C-511       |
| YIELD. FITS 70 PRINTERS       |          |               |                        |            | 'High Yield" |                   |             |
| EPSON MX70/BD                 | 1/pk.    | 16.00 ea      | 1 6.00 ea              | (13.95 ea) | 500"x60"     | Nylon Jet Bik     | C-522       |
| IBM -"SILVER DOLLAR" Sys.     | 5/pk     | 5.80 ea       | 14.90/5 pk             | (2.98 ea)  | 9/16" x 30"  | Nylon Jet Blk     | R-300       |
| 34. Sys. 32 MDLA, Series      |          |               |                        |            |              | 1                 |             |
| IMDL4974, 5256, 3287, 3770.   | 1        | i l           |                        |            |              |                   |             |
| 3771-3774, 4974, 5100, 5103.  | l .      |               |                        |            |              | 111               |             |
| 5110, 5228, 5256, 5320MDLA    |          |               |                        |            |              |                   |             |
| IBM - HARMONICA 1/2". SERIES  | 3/pk     | 9.42 ea       | 20.85/3 pk             | (6.95 ea)  | 1 2" x 108"  | Nylon Jet Blk     | C-350       |
| I. MOD 4973/II. 3200. 3289.   | 1 -, ,   | G             |                        | ,,         |              | 1171011 501 511   |             |
| MOD 2                         |          |               |                        |            |              |                   |             |
| NEC SPINWRITER                | 4/pk     | 23.40/3 cart  | 23.60./4 pk rb. reload | (5.90 ea)  | 1/2" x 51"   | Nylon/Ex Lng Life | R-400       |
| DUME (FITS 80 PRINTER MODS)   | 3/pk     | 18.00/3 pk    | 13.95/3 pk             | (4.65 eaj  | 1/4" x 310   | Multistrike Film  | C-525       |
| RADIO SHACK DAISY WHEEL II    | 1./pk    | 24.95/3pk     | 8.25                   | (8.25 ea)  | 250"         | Mylar Multistrike | C-789       |
| RADIO SHACK LPIII, LPV        | one/pk   | 13.95/cart    | 8.95/Reload rib. only  | (8.95 ea)  | .500" x 45"  | Nylon Incl Instr  | R-T3        |
| RADIO SHACK LPII. LPIV        | 3/pk     | 18.95/3 pk    | 11.95/3 pk             | (3.98 ea)  | 563" × 45"   | Nylon Jet Blk     | C-700       |
| TELETYPE MDD 33, 28, 35, 37,  | 10/pk    | 2.40 ea       | 13.90/10 pk            | (1.39 ea)  | 1/2'' x 36'  | Nylon Jet Blk     | R-450       |
| 38 BB                         | 1        |               | ,, p"                  | ,          |              | ,                 |             |
| WANG M/S. 5541W. WC. 5581.    | 1/pk     | 6.85 ea       | 5.95 ea                | (5.95 ea)  | 5/16" x 393" | Multistrike Film  | C-550       |
| WO. 6581W. 2281W              | .,,,,,   | 0.03 03       | 0.55 60                | ,0.00 (0)  |              |                   | 0 555       |
| ,,,                           |          |               |                        |            |              |                   |             |





#### **TERMS:**

MINIMUM PURCHASE - \$20 PAYMENT BY: C.O.D.(UPS), CHECK, MASTER CARD, OR VISA CHARGE CARD.

**VOLUME DISCOUNTS:** 20 - 50 PACKS 10%

51 - 100 PACKS 15% \*UNDER \$20, ADD \$5 HANDLING. \*\*APPROX. RETAIL. PRICE VARIES

**ANCIE LABORATORIES** 

5200-J Philadelphia Way 301-345-6000 (Wash, D.C. Local) Lanham, Maryland 20706 301-792-2060 (Balto, MD Local) 800-638-0987 (National)

| NA <u>ME</u>                                                            |                                                                                                     | QTY | CAT.#   | AMT. | ☐ Check Enclosed                            |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----|---------|------|---------------------------------------------|
| ADDRESS                                                                 |                                                                                                     |     |         |      | □ C.O.D.<br>□ VISA                          |
| CITY                                                                    | STATEZIP                                                                                            |     |         |      | ☐ MASTER CHARGE                             |
|                                                                         |                                                                                                     |     |         |      | ACCT. #<br>EXP. DATE                        |
| ANCIE Laboratories<br>5200-J Philadelphia Way<br>Lanham, Maryland 20706 | 301-345-6000 (Wash. D.C. Local)<br>301-792-2060 (Balto. MD Local)<br><b>800-638-0987 (National)</b> |     | TOTAL . | -,   | MIN. ORDER \$20<br>PRICES SUBJECT TO CHANGE |

```
** get 1 key with blinking cursor
1000 IF POINT(X,Y) THEN RESET(X,Y) :GOSUB 5000 :SET(X,Y)
 ELSE SET(X,Y) :GOSUB 5000 :RESET(X,Y)
1010 K$=INKEY$:IF K$="" THEN GOSUB 5000 :GOTO 1000
1020 \text{ K=ASC(K\$)} : \text{RETURN}
1990 '**
 ** decode keypad as a vector byte
2000 Kl=INSTR(VK\$,K\$)
2010 MP=0 :IF K1>9 THEN MP=1 :K1=K1-9
2020 V = CH(K1) - 16 * MP
2030 RETURN
2040 '**
 ** non-disk: for above
 use
 ** 2000 K1=0 :FOR J=1 TO LEN(VK$)
 2002
 IF MID(VK,J,1)=K THEN Kl=J
 ** 2004 NEXT
 ** same for below, using CK$
2990 '**
 ** Decode a command
3000 K2=INSTR(CK$,K$) : RETURN
3990 '**
 ** adjust X and Y according to vector V
4000 IF V AND 1 LET Y=Y-1
4010 IF V AND 2 LET Y=Y+1
4020 IF V AND 4 LET X=X+1
4030 IF V AND 8 LET X=X-1
 '** screen wrap-around
4040 X=X+(X>127)*128 - (X<0)*128
4050 Y=Y+(Y>47)*48 -(Y<0)*47
4060 RETURN
4990 '**
 ** short delay routine
5000 FOR DELAY=1 TO 30 :NEXT :RETURN
5990 1**
 ** exit editor, compile shape$
 <ENTER>
 ** and write to disk
6000 SHAPE$=""
6010 FOR J=1 TO LAST
 SHAPE$=SHAPE$+CHR$(V(J))
6040
6050 NEXT
6060 PRINT@ 0, CL$; :INPUT"disk save on line number";LN!
6070 PRINT CL$; :LINEINPUT"string variable name? ";SN$
6080 DW$=STR$(LN!)+" "+SN$+"="+CHR$(34)+SHAPE$+CHR$(34)
6083 PRINT DW$: PRINT
6085 Q$="" :INPUT"format ok";Q$:IF Q$="N" CLS :GOTO 6060
6090 IF F1=0 THEN F1=1 :PRINT CL$; :LINEINPUT "filespec? ";FS$
 : OPEN"O",1,FS$
6100 PRINT#1,DW$
6110 '
6120 CLS :Q$="" :INPUT "edit another string (Y/N)";Q$
6130 IF Q$="N" THEN CLOSE : END
6140 GOTO 65
8999 '**
```

\*\* instructions

```
CREATE...a graphics editor for KWIKDRAW"
9000 CLS :PRINT "
9010 PRINT"This program is an aid in creating and modifying a"
9020 PRINT"string of vector characters: `A'-`J' and `l'-`:'"
9030 PRINT"You may input or build this string with the editor."
 <7>"
9040 PRINT"
 The NUMERIC KEYPAD is used to
 * "
9050 PRINT move a cursor in
 the desired
9060 PRINT"pattern.
 - <4>"
 Use these keys whenever
 * "
9070 PRINT"you are prompted for a VECTOR and
9080 PRINT"while extending the shape.
 <3>"
 <1>
 <2>
9090 PRINT"
 The <0> key is used to cancel commands and to"
9100 PRINT"exit EXTEND mode."
9110 PRINT"
 You may define the X and Y screen positions for"
9120 PRINT"your `model' and your `working copy'. The top line"
9130 PRINT"shows: the current X and Y, offsets from the start,"
9140 PRINT"the PRINT@ position, position within the shape,"
9150 PRINT"and length of the shape string.";
9160 PRINTTAB(50); "Press <ENTER>"; :X=126 :Y=46 :GOSUB 1000
9999 '**
 **
 Menu of commands
 \langle M \rangle
10000 CLS: PRINT TAB(9); "Create - graphics editor for KWIKDRAW"
10010 PRINT"commands:";TAB(38);"....by Dan Rollins"
10040 PRINT"
 <spacebar>...cursor forward"
10050 PRINT"
 </>.....cursor backward"
 <a>>...........Abort edit without change"
10060 PRINT"
10070 PRINT"
 <ENTER>.....exit editor & save shape to disk"
10080 PRINT"
 <D>.....Delete a single vector"
 <L>.....List (draw) shape, cursor to start".
10090 PRINT"
10100 PRINT"
 <S>.....Search for a vector"
10110 PRINT"
 <C>.....Change a vector"
10120 PRINT"
 <I>.....Insert a single vector"
10130 PRINT"
 <X>.....eXtend shape (enter EXTEND mode)"
10135 PRINT"
 <1> - <9>....vector keys for S,C,I,X commands"
10140 PRINT"
 <0>......escape from S,C,I,X commands"
10160 PRINT"
 <SHIFT>.....move-only vector (with <1> - <9>)"
10170 PRINT"
 <M>.....display this list";
10175 PRINT TAB(50); "press <ENTER>";
10180 X=126 :Y=46 :GOSUB 1000
10190 IF I=0 THEN I=1 :CLS :RETURN
```

#### XEROX SPECIAL • 8088 CO-PROCESSOR \$699 FOR 820 820II (64K RAM INCLUDED - UPGRADABLE TO 256K) **XEROX 820 II SYSTEMS** 820-II FEATURES: 4MHz, Z80A, CPM BASED, 64K RAM, 12" HIRES SCREEN (24 x 80), DD DISK CONTROLLER, THIN LINE GRAPHICS, ENHANCED SCREEN FEATURES (HIL INTENSITY, REVERSE VIDEO, FLASHING CHARACTERS), TONE GENERATOR, 2 RS-232 PORTS, ONE PARALLEL PORT, ALSO BOOTS AS INTELLIGENT TERMINAL. LIST SALE \$3295 \$1995 51/4" SS/DD 51/4" DS/DD \$3695 \$2295\* \$4095 \$2695\* 820/820 | OPTION PKG. | Save \$46! • Z80BCPU SPEEOUP -to 5MHz for 820 • Z80C CPUSPEEDUP -to 8MHz for 820| OPTION PACKAGE II Save \$791 • INCLUDESALL THE OPT. PKG. I PLUS— 8" SS/DD 8" DS/DD \$189 \$ 29 \$ 19 \$ 19 \$ 29 10 Diskettes (DS & 8" slightlyhigher) Surge-ProtectedMultiple OutletStrip Enter KeytorNumeric Keypad DISPLAY RISER - Elevates 5", Steel Construction ACRYLICGREENSCREEN - Molded to fit CRT ANTI-GLARE SCREEN - Nylon, stretches over CRT. SYSTEM DUST COVERS -(3) (8° sightly higher) MICTOWES \$199for 820, \$239for 820-1 \$299 for 820, \$339 for 820-11 \$ 699 820Double Density Kit \$ 799 820II Extended DD (670k/side) 8088 Co-Processor/64k \$249 5 MB Hard Disk - exp.to20MB Box 545, 1700 Front Street Fort Benton, MT 59442 CALL COLLECT TO ORDER: (406) 622-5651 9-5 MST, M-F 128k Version 820ll Extended DD (670k/side) \$ 99 32k Printer Buffer AmberorGreenCRTreplacement \$ 89 Hayes Smartmode 256k Version 256k Version + CP/M-86 \$1250 Parallel Printer Cable \$ 49 Anti-Static Floor Mai VISA, NC, CK, MO, COO, Add 3% for VISA or MC, Add 3% for Ship Hending Ins. Via UPS. Minimum \$2.50 DEALER C.ITOH Prowriter Prowriter 2 F-10 Daisy Xerox 25 cps Dalsy \$1195 Xerox 40 cps Dalsy \$2095 Qume Sprint 11 + /40 \$1395 VISAccount BenchMark CP+ INQUIRIES XEROX 820/820 If are trademarks of XEROX Cor CPAX is trademark of the Digital Research Corp. WELCOME

10200 GOTO 700

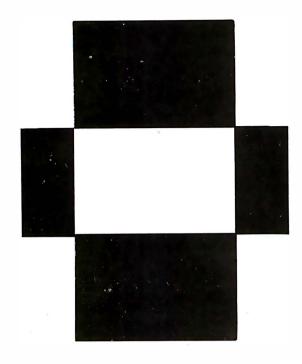
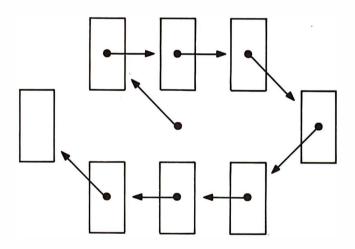


Figure 1: A simple figure drawn using the CREATE program.



**Figure 2:** Sequence of cursor moves showing how figure 1 was drawn. The figure has been expanded for clarity.

Text continued from page 394:

walk through a sample session. For example, to create figure 1, we ordinarily write this BASIC subroutine:

1010 SET(X+1,Y+1) : SET(X,Y+1) : SET(X-1,Y+1) : SET(X-2,Y)

1020 RETURN

A GOSUB to this routine would slowly draw the shape in a position relative to the key position defined by the X and Y coordinates.

Defining the same figure as a series of vectors can be as easy as running the CREATE program (see listing 3) and

using the numeric keypad to move a dot in the necessary pattern. But to *understand* the process, look at figure 2. Beginning at a central position, the first cursor motion will be northwest with the resulting pixel turned on. The next two motions are east, etc. The result is a pattern of directions:

Referring to table 1, we see that these vectors are defined by the characters

#### IDDFJHHI

The shape would be defined within a BASIC program as

$$SHAPE\$ = "IDDFJHHI"$$

Now that the shape is defined, it may be drawn at any screen position by storing a few parameters and invoking the KWIKDRAW USR routine.

The shape-interpreter will look at the bit positions of each of the vector bytes to determine the direction in which to move the cursor. The control codes (A through J and 1 through :) were chosen specifically for the bit positions of their binary values. Using these bit patterns as instructions, KWIKDRAW decodes these bytes as motions of a cursor. For example:

| Direction | Vector<br>ASCII hexadecimal | Bits<br>76543210<br>WESN | Vector<br>ASCII hexadecimal | Bits<br>76543210<br>WESN |
|-----------|-----------------------------|--------------------------|-----------------------------|--------------------------|
| North     | = A = 41 =                  | 01000001                 | 1 = 31 =                    | 00110001                 |
| East      | = D = 44 =                  | 01000100                 | 4 = 34 =                    | 00110100                 |
| Northeast | = E = 45 =                  | 01000101                 | 5 = 35 =                    | 00110101                 |

Bit 0 (the rightmost bit) of a byte is the flag for moving north, and bit 3 indicates motion east. When both bits 0 and 3 are 1, motion is to the northeast. Also, notice that A and 1 have the same binary value with the exception that bit 4 is on in the latter. This bit is tested to determine whether to move without changing whatever is in the background. Bits 5, 6, and 7, untested by the program, are on only for the convenience of the BASIC programmer.

The first action taken by KWIKDRAW in vector interpretation is the adjustment of its X,Y pointer. Usually, the key position (the X,Y pair passed to the program) will not be plotted. Remember, the principal aspect of a vector is *motion in space*. If you want the very first character to indicate a screen change at the exact coordinate defined by the X,Y parameters, a move and plot command of C will first move the cursor north, then south and plot the position. Otherwise, the first position plotted will be offset by one step from the starting X,Y coordinate in the direction defined by the vector.

#### **Passing Parameters**

Four basic parameters are required by KWIKDRAW in its processing of a shape-definition string:

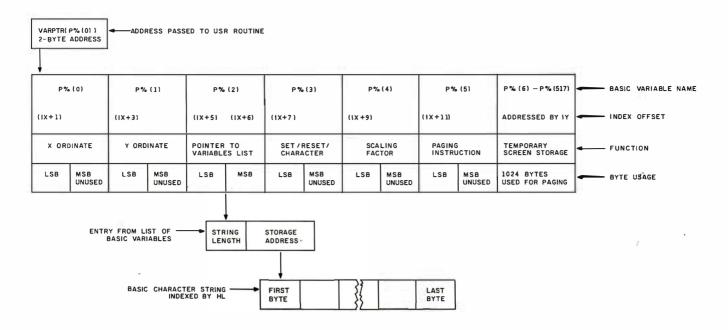


Figure 3: Organization of string data accessed by the VARPTR function of the KWIKDRAW program.

- where to draw the shape (an X,Y coordinate pair)
- whether to set/reset a pixel or use a character
- a pointer to the shape-definition string
- a scaling factor to define the size of the shape

Additionally, you may decide whether or not to page the screen workspace in or out of video memory—more on that later.

An inherent limitation of the USR hook is that only one integer argument at a time may be passed to the routine it calls. Because of the number of parameters needed by KWIKDRAW, a sophisticated protocol was developed. The arguments are placed in elements of an integer array, and the address of the first array element is passed to KWIKDRAW.

The VARPTR function returns an address that points either directly or indirectly to the storage address of the variable.

VARPTR(integer array variable) points directly to a contiguous block of main memory, addressing the LSB (least significant byte) of the variable named. The next higher address is the MSB (most significant byte), the following 2 bytes are the LSB and MSB of the array element next in line, etc. For example:

This will print

2 0

The variable is stored using the two's complement convention. Negative numbers have been increased by 1 and

have had all bits flip-flopped. Thus, if A%(0) = -2, the result would be

254 255

VARPTR(string variable) returns an address that is the location of a block of data associated with the string. The address itself will contain a 1-byte string length (0–255). The next 2 bytes are a pointer to the actual main-memory storage location for the characters. This address is read in normal Z80 format, that is, MSB followed by LSB. Figure 3 should help in visualizing just how the addresses are accessed by KWIKDRAW.

One word of caution when using these facts in conjunction with the USR command. It is usually desirable to include the VARPTR function explicitly as the USR argument, rather than setting a variable to the value for reuse. For example, always pass the pointer with

UU = USR(VARPTR(P%(0)))

Don't use

VP = VARPTR(P%(0)) : UU = USR(VP)

The reason for this is based upon Microsoft's variables table handling. Simple (nonarray) variables are inserted into the list on the fly. As a new simple variable is created, all array variables are pushed higher in memory. In the example above, VP will point correctly *until the storage for the UU variable is allocated.* The insertion of UU into the variables table alters the position of the P%() array, making the value of VP invalid. Also, the address returned by VARPTR(*string variable*) may be invalidated by BASIC's string reorganization.

#### START YOUR OWN COMPUTER CO.

#### HOW TO START YOUR OWN SYSTEMS HOUSE 7th edition, November 1981

Written by the founder of a successful systems house, this fact-filled 220-page manual covers virtually all aspects of starting and operating a small systems company. Contracts, proposals, agreements and a complete business plan are included in full, and may be used immediately. Proven, field-tested solutions to the many problems facing small turnkey vendors are presented.

#### HOW TO BECOME A SUCCESSFUL COMPUTER CONSULTANT

by Leslie Nelson, 4th revised edition, December 1981

The rewards of the consultant can be high: freedom, more satisfying work and doubled or tripled income. This manual provides comprehensive background information and step-by-step directions for those interested to explore this lucrative field.

#### HOW TO START YOUR OWN COMPUTER STORE 1st printing, March 1983

You too can participate in the 1983 computer store boom . . . follow the success patterns (and learn from the mistakes) of 170 computer stores we investigated while preparing this manual. • Detailed analysis of the five major computer store strategies • franchises • distributors • start-up plan • low-budget plans • detailed business plan.

#### HOW TO START YOUR OWN WORD PROCESSING SERVICE

\$48.

by Leslie Nelson, 2nd edition, November 1982

\$36.

FREE-LANCE SOFTWARE MARKETING by B.J. Korites, 3rd edition, June 1980

1983 SOFTWARE WRITER'S MARKET

\$28.50

1st printing, January 1983

HOW TO SELL YOUR MICRO SOFTWARE by B.J. Korites, Ph.D. May 1982

\$19.95

Send check, money order. VISA. Master Charge or American Express # and exp. date. Publisher pays 4th class shipping. Add \$1.00 per book for UPS shipping (USA) only). NJ residents add 5% sales tax. For faster shipment on credit card orders call (201) 783-6940.

#### ESSEX PUBLISHING CO. Dept. 2

285 Bloomfield Avenue . Caldwell, N.J. 07006

#### We will train you in UNIX™ and the "C" Language

...And, back it with 50 years of technical experience.

The leader in on-line data information equipment and applications for over 50 years Bunker Ramo now provides a training course which gives you:

- · A one terminal/one user classroom environment
- Proven hands-on learning techniques
- Comprehensive textbooks
- Complete course documentation
- State-of-the-art instructional
- Special group registration rates

Current course offerings include:

- Introduction to the UNIX environment (5 days)
- Introduction to "C" programming language (5 days)
- Advanced UNIX methods (5 days)
- Advanced "C" methods (5 days)

For a detailed prospectus, call or write:

Bunker Ramo Information Systems Training Services Group

35 Nutmeg Drive Trumbull, CT 06609 (203) 386-2600



P%(0) = key horizontal(X) ordinate:

0-127 (PIXEL mode) display range:

0-63 (CHARACTER mode)

P%(1) = key vertical (Y) ordinate:

display range: 0-47 (PIXEL mode)

0-15 (CHARACTER mode)

P%(2) = pointer to string variable data block: usually VARPTR(shape\$)

P%(3) = display mode:

0 = RESET pixels

1 = SET pixels

2-255 = display character

P%(4) = scaling (magnification) factor:

possible range: 1-256 (0 = 256)

practical range: 1-15

P%(5) = paging code:

0 = copy screen to memory, draw shape, copy memory to screen

1 = copy screen to memory, draw shape

2 = draw shape, copy memory to screen

3 = draw shape (in memory only)

Table 2: Control parameters used in the passing of parameters to the shape interpreter.

These problems crop up only when they're least expected. They may always be avoided by taking this precaution: Never define a new variable between the storing of parameters in the P%() array and the invoking of the USR command. This is the first place to start looking when KWIKDRAW does something unexpected.

Table 2 indicates the array variables used in the passing of parameters and the limits associated with each. Discussion of this parameter array will always refer to the P%() array. Any INTEGER variable array would work. however, and the "%" character may be omitted if a DE-FINT command has been specified for the variable.

Note that invalid data in these variables will not crash the program. A possible problem, however, is encountered when the scaling factor is set to 0. KWIKDRAW will appear to lock up because it cycles through the SET/RESET routine more than 65,000 times per shape-definition byte. The practical range for scaling a pixel shape is approximately 1 to 15.

Invalid X,Y coordinates are ignored by the program. A shape may be drawn so that part of it is off the screen. Specifying ordinates less than 0 or greater than the screen size is allowed. It is usually advisable to use a central point of the shape as the key vector during shapedefinition. This gives the shape its maximum range of motion during animation. Another reason for this precaution is due to the nature of the scaling function.

When the scaling factor is greater than 1, each vector will be drawn as a filled rectangle SCALE wide by SCALE high. The rectangle will be placed with its northwest corner at the current cursor position, and cursor motion will be in increments with the step size equal to SCALE. As the shape is enlarged (its scaling factor is increased), the shape will appear to move southwest. Assuming that the key position remains the same, the vectors will force cursor motion in greater and greater steps and fill larger and larger blocks. By using a central location within the shape as the key vector, this sliding effect can be minimized.

#### Paging the Video

A flaw in the TRS-80 Model I hardware causes an effect known as hashing on the video screen. Unwanted streaks and flickering can be seen during rapid graphics operations. The TRS-80 Technical Reference Handbook explains that the video-divider chain loses control of the display for short periods of time while the central processing unit accesses video memory. Unfortunately, the only way to minimize this effect is to address video RAM (random-access read/write memory) as seldom as possible.

KWIKDRAW may make hundreds—even thousands—of accesses to video RAM during the drawing of a single shape. The resulting hashing could be an irritating source of eye fatigue. Additionally, the action of drawing a complex shape (or one scaled to many times its original size) takes a certain amount of time-even at machine-language speeds. It is desirable to eliminate this visible lag between the drawing of the first and the last vector.

For these reasons, a paging feature is included as part of the machine-language code. KWIKDRAW uses nonvideo RAM as working storage for the screen. All shapes are drawn in this work area-screen memory being addressed only at the start and/or end of the shape-drawing process. Of special significance are the options of (1) copying the current contents of the screen to storage, and (2) drawing multiple shapes within the working storage before moving it to the display area. Though screen hashing is not completely eliminated, the utility of KWIKDRAW is greatly enhanced by the inclusion of this paging function.

Video-paging requires that 1024 bytes of main memory be set aside for working storage. To avoid having to set MEMORY SIZE and to keep the program compatible with TRS-80 Models I and III of all memory configurations, the storage area for an integer array is used for manipulating the screen. Because the P%( ) array is being used to pass parameters to KWIKDRAW, it is the logical place for the screen work area. Therefore, this array must be dimensioned to at least 517. The first six elements (0-5) are for parameter passing. The rest (512 elements with 2 bytes per element = 1024 bytes) are used for screen operations.

The paging is performed using the Z80 op code LDIR, a block-move instruction. This is a memory-to-memory transfer that moves bytes from the source address defined by the HL register pair to the destination address held in DE. The BC register pair is automatically used as a byte counter for this operation and is set here to 1024—the total number of screen bytes. For paging out of video RAM, HL is pointed to the screen address (3C00 hexadec-

#### **Get The Most From Your NEC** PERSONAL COMPUTER With RACET COMPUTES Software and HARDWARE!!!

 $\star\star\star\star\star$  NEW - NEW - NEW - NEW - NEW - NEW - NEW  $\star\star\star\star\star\star$ 



**RACET RK-4/8 MULTIPLEXOR** 

Schools — Businesses — Word Processing!!! The RACET MK4/8 Multiplexor allows multiple users to share the same mass storage, whether it is floppy disk or the RACET Hard Disk. The Multiplexor is fully supported under the RACET 'Everything' DOS. Users can work in mixed ROM BASIC and CP/M Call Compatible modes. All users can request information and be writing to the disk simultaneously. The multiplexor not only provides a cost-effective solution to users requiring multiple computers, but also provides the power of sharing data.

4-Port Mux S745

SYSTEM SOFTWARE RACET COMPUTES = SYSTEM SOFTWARE

SYSTEM SOFTWARE RACET COMPUTES

11

RACET COMPUTES

SYSTEM SOFTWARE

1

SYSTEM SOFTWARE RACET COMPUTES

WARE RACET COMPUTES

SOFT

8-Port Mux S945

#### CALL FOR LOWEST HARD DRIVE PRICES FOR NEC

RACET NECDOS FOR YOUR PC-8000 AND PC-8800!! THE 'EVERYTHING' DOS!!! \$225 Has ROM BASIC mode. Has CP/M∗ compatibility mode. Works in both modes with the RACET RK 4/8 Multiplexor for shared disk environment. Supports the RACET Hard Disk in both modes and optionally with the Multiplexor.

RACET NECDOS does more for your PC-8001 than any other DOS. It's faster, more efficient and easier to use. It's loaded with extra features to let you stretch the limits of your system

EMPHASIZES INTEGRITY. NO MOUNT or REMOVE commands. Excellent protection from improper diskette swapping. File password protection.

ADVANCED FEATURES. All DOS functions and commands may be used directly in a BASIC program!!! Special RUN option allows merging of programs, retaining all variables in memeory. Fixed block spanned records. AUTO and DO commands. Machine language loads and saves MATPRINT and MATINPUT to disk. Complete directory. All supervisory calls documented and available to the machine language programmer. Superzap and other extensive utilities.

\* NEW \* ELECTRIC PENCIL\* \* \* \$99.95

THE most popular Microcomputer Word Processor in the world now available on the NEC!!! With many added features. Embedded print commands. Print from memory and disk!! Settable tabs. Indent and hanging indent. Parallel, Serial, and Video drivers. DICTAMATIC cassette control for translating dictated messages!! And much more!!! Most features of word processors costing five times as much!!! Runs on 32K or 64K system!!! Works in multi-user environment with the RK4/8

#### \* NEW \* ELECTRIC SPREADSHEET \* \* S75

A BASIC Spreadsheet program for the PC-8001. Anything you work with columns and rows and a calculator belongs on the Electric Spreadsheet. Results formatted for screen or printer. 'What if' questions answered. P/L forecast. Personal budget. Real estate investment. Net worth forecast. Cash flow estimates. Business forms. Works on 32K or 64K system! ¶ 70 operators plus histogram plot, revise spreadsheat layout, and more. Select preprogrammed operators for line. column, or cell calculations. Set column widths and number of decimals. Manual and diskette include 22 examples

#### \* NEW \* ADVANCED PROGRAMMING BASIC \* \* S60

THE functions and commands in this package give you extended control over data and your PC-8001 system. These extensions to NBASIC provide complete conversion of time and date functions including days between dates and Julian dates. Extended string functions include justify, truncate. center, rotate, translate, shift, pack, and search. Array functions include masked search of both sorted and unsorted arrays, and insert in sorted arrays.

MULTI-KEY SORT "MKS" S60

SUPER FAST Machine Language In-Memory Sorts. Three key sort on 500 elements in 4 seconds!!! Simple one-line BASIC functions - SORTV and SORTC VERBS. Mixed ascending and descending keys.

#### BASIC PROGRAMMING UTILITIES 'BASUTIL' S60

COMPRESS, EXPAND, PRETTY, XREF Cross Reference Utility. Great for modeling, debugging and structuring BASIC programs.

#### KFS-80 KEYED FILE SYSTEM 'KFS-80' \$150

MACHINE language BASIC ISAM utility provides keyed and sequential access to multiple files. Simple interface to BASIC. Binary tree keyed-file index system provides rapid access to records.

#### CONVERT TRS-80° PROGRAMS TO RACET NECOOS WITH 'PROTRAN' \$99.95

COMPLETE utilities for file transfer and BASIC program conversion, MOD III diskettes may be read directly, MOD I and II via RS-232. Transfer BASIC programs, data files, or machine language files. NO SUPPORT is provided for conversion of machine language files or PEEK's, POKE's or USR's to function on PC-8001. Substantial knowledge of TRS BASIC and NBASIC required. Package designed for software authors.

AVAILABLE FROM YOUR LOCAL NEC DEALER or from RACET computes

CHECK, VISA, M/C, C.O.D., PURCHASE ORDER

COMPUTES LTD.

Telephone Orders Accepted 1330 N. Glassell. Suite M, Orange. CA 92667 (714) 997-4950

- \* TRS-80 IS A TRADEMARK OF TANDY CORPORATION
- \* CP/M IS A TRADEMARK OF DIGITAL RESEARCH
- \* ELECTRIC PENCIL PENCIL IS A TRADEMARK OF MICHAEL SCHRAYER
- \* ELECTRIC SPREADSHEET IS A TRADEMARK OF DAN G. HANEY & ASSOCIATES

Circle 362 on Inquiry card.

February 1983 © BYTE Publications Inc 421

#### Description of the KWIKDRAW Assembly-Language Program

Much of the utility of KWIKDRAW is rooted in the fact that it is located on a BASIC program line and avoids the necessity of reserving high memory. Several trade-offs were needed to accomplish this end. Speed is traded for relocatability, program size is traded for compatibility with the BASIC program line format, and modularity is seemingly lost in the necessity of avoiding CALLs.

The program is, however, written in a modular style with each section being basically self-contained. First, the program initializes its variables. Then it takes the requested paging action. The next section interprets each of the bytes of the vector string. It adjusts the horizontal and vertical pointers, determines plot/no plot action, and plots a position according to the scaling parameter. Finally, the return paging action is taken and execution is passed back to BASIC.

The CALL to 0A7F hexadecimal in line 1050 returns HL with the address of the first byte of the P%() array. The IX index register is immediately set to this value by pushing it from HL onto the stack and popping it into IX. Because this address points directly to the X (horizontal) ordinate, the offset byte used in accessing the value would assemble to a 0. Because BASIC line format dictates that this must be avoided, IX is decremented. The X ordinate is now found in the address referred to by IX+1.

The address used for the start of screen storage is used several times during the program. It is convenient to have it accessible as a main register. This address is the same as the location of the seventh element of the parameter array P%(6), and is calculated by adding 12 to the USR argument, i.e., the start of the P%() array. Then it is saved in the IY register. Lines 1850, 2380, and 2840 access this address with a PUSH and a POP to another register.

When the storage address has been determined, the paging action takes place. Two of the four possible paging codes, held in P%(5), request that the current contents of the screen be copied to storage before any shape-drawing occurs. Testing the lowest bit of P%(5) sets a flag used in selecting the desired action. The BIT op code used here (testing a single bit of a byte at an indexed address) is very useful in this type of bit-logic application. As with all BIT testing, the Z flag is set when the bit is off. Think of it as complementing the test bit and placing it into the Z flag, or remember that the Z flag is set as if a CP (compare) operation was performed between the test bit and a 0.

When the paging argument is 0 or 1, the screen is moved into the storage area. Notice in lines 1250–1280 that absolute addresses of 3C00 and 0400 hexadecimal must be loaded into the HL and BC registers. Here again, the zero bytes must be avoided so that the registers are loaded, then decremented or incremented to the correct values. The LDIR (load, increment, and repeat) op code duplicates the screen bytes into the storage area where they may be altered with a minimum of screen hashing.

Lines 1310-1420 finish the initialization process. The number of characters in the vector string is saved in the B register, the starting X and Y coordinates are placed into the D and E registers respectively, and HL is pointed to just efore the start of the vector string. The program is now set

up to begin the interpretation process.

The main loop decodes each vector byte as motions of an X,Y pointer. HL is adjusted to point to the byte to decode. The bits of this byte are tested individually. The DE pointer is adjusted in any of eight directions—according to which of the bits are on. Adjustments are made in increments of the scaling factor. When DE has been updated, the fifth bit is tested for a plot/no plot action. If the byte being examined is an ASCII character between 1 and: (31-3A hexadecimal), the main body of the program is skipped. Register B is decremented; if it's not 0, execution loops back to decode another vector.

A truly modular program would simply make a CALL to the plot routine when the characters A through H were encountered. KWIKDRAW must jump past the program exit code to line 1960 where the plotting action begins. A pair of nested loops is set up in lines 1960–2090. If programmed in BASIC, the rest of this program would look something like

10 FOR J=1 TO SCALE
20 FOR K=1 TO SCALE
30 SET(X+K,Y+J)
40 NEXT K
50 NEXT J

When SCALE = 0, the loops are each performed 256 times. This mistake will cause a delay of about 7 seconds per (plotting) vector byte.

The loops are ended at lines 3030–3170. The outer-scaling loop sends control back to the top of the main loop by way of a two-span bridge. Because the Z80 JR (jump relative) op code has a range of -126 to +129 bytes from the program counter, and the distance between the bottom and the top of the loop is outside this range, this indirect route must be taken. Two spans to the bridge avoid breaking up any of the logical program modules.

The assembler code analogous to the SET(X+K,Y+J) example from above is actually two separate modules. Depending on the value of the SET/RESET/CHARACTER parameter passed in P% (3), a point is defined as either a single pixel or an entire byte of memory. When P% (3) is greater than 1, the code beginning at line 2230 (CHARACTER mode) is invoked. Here, a PRINT@ screen position (0-1023) is calculated from the X and Y coordinates. The formula used is position = (Y\*256 + X\*4)/4. This is calculated very rapidly using the register shift and rotate directives. The position obtained is added to the start of the screen storage area, yielding an address to which the parameter byte is saved.

Calculations for determining which pixel to set or reset are somewhat more complicated. Both a PRINT@ position and a pixel value must be ascertained. The former is simply position = (INT(Y/3)\*256 + INT(X/2)) / 4. The remainder of the Y/3 operation (0-2) is saved in the B register, and the carry flag holds the remainder left after the division by 4 (0 or 1).

A pixel is lit by applying a logical OR to the graphics byte at the indicated position. Masking the same value from the Text box continued on page 423

#### Text box continued:

byte will darken this pixel. Graphics bytes will always have a value greater than or equal to 128 (80 hexadecimal). Applying the logical OR to one of these values:

and to any graphics byte, will light the respective pixel.

The SET/RESET routine of KWIKDRAW determines which of these values to use by multiplying the B register by 2 and adding the carry flag value, then extracting 2 to the power of the resulting sum. The formula, where MOD is a remainder function, is

$$bit = 2 \uparrow (MOD(Y/3) * 2 + MOD((INT(Y/3) * 256 + INT(X/2)) / 4))$$

Once these numbers have been obtained, the screen storage byte is modified for the indicated action. Any nongraphics byte at the position is first changed to a blank graphics byte, For a SET action, the pixel value is compared with the current byte using a logical OR operation. A RESET action is performed by complementing the pixel value and then performing a logical AND with the position byte. The resulting byte is saved at line 2980. Incidentally, this SET/RESET routine is modeled after the one found in the Level II ROM. Several modifications made it relocatable and speeded it up a bit.

Both the SET/RESET and the CHARACTER routines check for coordinates that would modify bytes outside the storage area. When an X,Y pair is out of range, the routine is simply skipped—allowing shapes to be drawn wholly or partially off the screen.

Finally, the last vector byte has been interpreted when the B register is decremented to 0 by the DJNZ on line 1750. Execution falls through to the paging and exit module. Here, the paging argument is again tested. A value of 0 or 2 causes the updated storage area to be copied onto the screen. Control is then handed back to the BASIC program.

imal), and DE is set to the address of the sixth element of the P%() array. The LDIR op code then copies the screen to the storage area. Paging back into video RAM is accomplished by reversing these registers so that the storage area is copied to the screen.

A detailed description of the KWIKDRAW shape-table interpreter (listing 1) is included with this article in a separate text box. This, plus the remarks within the listing, will explain the structure of the program and detail the techniques used in this example of hybrid programming.

The problem new users will most often experience with KWIKDRAW is incorrect handling of parameter passing. A BASIC programmer is used to having English-sounding words like PRINT and DRAW as commands. KWIKDRAW takes a giant step backward in this respect. There is no easy way to remember which parameter goes in which element of the P%() array.

I suggest that a copy of table 2 (the list of parameter codes) should be available for easy reference during programming with KWIKDRAW.

#### A Graphics Editor

CREATE is a handy utility program for defining the vector strings needed by KWIKDRAW (see listing 3). It is a graphics editor in much the same way that BASIC's EDIT mode is a text editor. Normally, you'll design a shape on a graphics worksheet and use CREATE for encoding it into a vector string.

Operation is simple; define two pairs of key X,Y coordinates at the prompts. The first is the position at which a reference model is drawn. The latter is for the working copy. Next, CREATE expects input of a series of vector characters that are to be edited. This is the only time you'll have to refer to table 1. You may use a null entry here to define your starting shape string as C—the plotthe-key-position vector described earlier. To edit a few

changes to a predefined string, you may read it in from disk, set SHAPE\$ to its value, and skip this input prompt.

Advance the cursor

Commands recognized by CREATE are

SPACEBAR

| 31 ACEDAN | Auvance the cursor                     |
|-----------|----------------------------------------|
| /         | Back up the cursor                     |
| A         | Abort edit without change to SHAPE\$   |
| ENTER     | Exit editor and save the shape         |
| D         | Delete a single vector                 |
| L·        | List (draw) the shape, cursor to start |
| S         | Search for a vector                    |
| C         | Change a single vector                 |
| I         | Insert a single vector                 |
| Χ         | Enter EXTEND mode (add vectors)        |
| 0         | Escape from S,C,I,X commands           |
| 1-9       | Vector keys for S,C,I,X commands       |
| SHIFT     | Move-only vector—with <1> through      |
|           | <9>                                    |

The L, S, C, and I commands are followed by a vector from the numeric keypad. The X command expects a series of such vectors.

Visualize the keypad as being superimposed on the screen with 8 at the top, 4 on the left, 3 at the lower right, etc. Move the cursor and plot the resulting pixel by pressing the key corresponding to the desired direction. Press the Shift key with the direction key to include a move-only vector. The 0 key is used to escape from any of the above commands.

Some important data is displayed during the editing process: the current X,Y pixel coordinate, the current PRINT@ position, the length of the string, and the current offsets from the starting X and Y. Though positions are relative during KWIKDRAW's interpretation of the shape, knowing the size of the shape is handy in defining multiple shapes (alphabetic characters, frames of anima-

tion), and the X,Y offsets are needed for chaining a series of complex figures.

Pressing the Enter key from COMMAND mode saves the shape in the variable SHAPE\$ for processing to disk. Don't have disks? Use LPRINT SHAPE\$ and copy it into your applications program. Don't have a printer? Get a pencil.

Disk users will be prompted for a file name and a sequential file is opened. You'll then be prompted for a line number and a variable name. The string is written as a BASIC line in the format

line# variablename="....vector characters...."

For example:

10240 SHAPE\$(2,4) = "IDDFJHHI"

The resulting file may be merged with an applications program that contains the KWIKDRAW routine. It would be easy to change the format so that the shape may be read as a DATA line.

#### Multiple Pages and Other Trivia

Some of the utility of KWIKDRAW will not be completely apparent until it has been used a few times. For example, a working page may be filled with any byte (except 0 or 1) by

CL\$="CDDD" P%(0)=0 : P%(1)=0 X and Y to top left P%(2) = VARPTR(CL\$) point to the four vectors CHARACTER mode) \_\_ scaling factor P%(4) = 16\_\_ don't page IN or OUT  $P\%(5) = 3_{\underline{}}$ UU=USR0(VARPTR(P%(0))) fill the page

Use this as a subroutine for clearing a page before building a frame of animation.

Sometimes BASIC is too slow in processing changes to a page between displays. By defining the P%() array with two dimensions, more than one page of video storage is available. For example, DIM P%(517,2) provides three (0, 1, and 2) separate pages for manipulation. Doubly dimensioned array variables are stored with the first-dimensioned subscripts varying fastest. Thus, P%(0.1) of the above example will actually be stored in the addresses sequentially adjacent to P% (517,0).

KWIKDRAW doesn't care what variable address it receives as the USR parameter. It does expect this address to point to a series of parameters followed by 1024 bytes for paging. Therefore, any of the dimensioned pages may be accessed by placing the parameters in the elements 0 through 5 of that subscript level, then invoking the shape-interpreter. At the expense of memory, multiple paging can provide maximum speed.

#### Get your computer talking and save \$126. The Type-'N-Talk™ speech synthesizer is now available for only \$249.

The Type-'N-Talk <sup>™</sup> text-tospeech synthesizer automatically translates your text into electronic speech and allows your computer to speak with an unlimited vocabulary. Standard with an RS-232C interface, Type-'N-Talk has an internal microprocessor and 750 character buffer. And remember, it doesn't use your computer's memory to make your text speak.

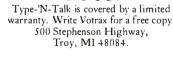
#### Here's what you get.

□ Unlimited vocabulary SC-01 speech synthesizer chip.

- □ Text-to-speech algorithm for 🐧 translation.
- □ RS-232C interface.
- □ Selectable Baud . (75-9600).









- □ Spelling and phoneme access modes.
- □ 750 character buffer.
- □ Data echo of ASCII characters.
- □ Complete installation and programming instructions.

Great new software is available for Type-'N-Talk equipped computer systems.

To order, see your local computer retailer or call toll-free

#### 1-800-521-1350

Michigan residents, call (313) 588-0341. MasterCard, VISA or

personal check accepted. The price is \$249 plus \$4 for delivery. Educational discount available. Add sales tax in Michigan and California.

© VOTRAX 1982

```
998 1**
 ** subroutine compiles a vector string which will
 ** connect 2 points.
 Most useful for coordinate pairs
 ** separated by 3 or less vectors
 -OR-
 when the line between the points is straight.
 1 * *
999
 On entry
 : Xl,Yl = starting point
 **
 : X2,Y2 = ending point
 * *
 : IN = 1 for plot vectors, 0 for move only
 **
 On exit
 : A$ holds vector string
 **
 : X1,Y1 become X2,Y2
 * *
1000 A$=""
1010 IF X1=X2 AND Y1=Y2 THEN RETURN
1020
 v=0
1030
 IF Y1>Y2 THEN V=V OR 1
 IF Y1<Y2 THEN V=V OR 2
1040
1050
 IF X1>X2 THEN V=V OR 8
1060
 IF X1<X2 THEN V=V OR 4
 A\$=A\$+CHR\$(64-IN*16+V)
1070
1080 GOTO 1010
1999
 1 * *
 ** subroutine rotates a vector string
 on entry : A$ = string to rotate
 **
 : R = number of 45 degree rotations (1-7)
 * *
 on exit
 : B$ holds rotated vector string
 **
2000 B$=""
2010 FOR J=1 TO LEN(A$)
2020
 V=ASC(MID\$(A\$,J,1)) : V1=V AND 15
2030
 FOR K=1 TO R
2040
 V2 = 0
2050
 IF V1 AND 1 THEN V2=V2 OR 5
2060
 IF V1 AND 2 THEN V2=V2 OR 10
2070
 IF V1 AND 4 THEN V2=V2 OR 6
2080
 IF V1 AND 8 THEN V2=V2 OR 9
 IF (V2 \text{ AND } 3)=3 \text{ THEN } V2=V2 \text{ AND } 12
2090
2100
 IF (V2 AND 12)=12 THEN V2=V2 AND 3
2110
 V1=V2
2120
 NEXT K
2130
 B$=B$+CHR$(V1 OR (V AND 240))
2140 NEXT J : RETURN
```

Listing 4 contains two subroutines that are useful in manipulating a predefined vector string. The routine at line 1000 demonstrates the flexibility of the bit logic of the shape-interpreter. Write a program that generates X,Y pairs—say a sine/cosine routine that draws a circle. For each new X, Y pair, call this routine and concatenate a string from the return value in A\$. The result would be a vector string that will draw a circle in the blink of an eye.

I determined that rotating a shape has limited value considering the asymmetric nature of the TRS-80 pixel. Therefore, this is not a function handled by KWIK-DRAW. It is simulated in the subroutine at line 2000, which will rotate a shape in increments of 45 degrees.

Normally, the resulting string would be typed into a program rather than calling this routine during operation.

#### Conclusion

The descriptions in this article can't convey the dynamic nature of shape-table graphics. I urge you to enter and use KWIKDRAW to see for yourself just what is possible. The effect is orders of magnitude beyond anything possible with BASIC alone. You've got a graphics tool now that can really "shape up" your TRS-80 graphics. Its use is limited only by your own imagination. Dazzle your friends with your programming expertise . . . you might even dazzle yourself!■

For \$20, Mr. Rollins will provide a Model I disk. It contains the published listings plus some further examples of shape-table graphics, including a program that manipulates a jumbo ASCII character set.

When your people need information from the company computer,

they should be able to get it with their own two hands.



Information.

It can be useful or useless. Timeliness makes the difference.

And therein lies the problem. In the conventional scheme of things, you can't get immediate answers from a computer. Because your questions can't be answered until they've been translated into FORTRAN or COBOL or RPG II or some other programming language.

Consider, now, the achievement of the Sperry Univac System 80 computer.

One of the good things System 80 brings you is ESCORT, a unique programming language you and anyone else in your company can handle with fluency. Because it reads like English. And you work with simple sentences.

ESCORT gives you the power to create your own precisely defined reports instantly, whenever the need arises. Right at your desk.

In fact, anyone in your organization with a need to know can generate customized reports in a matter of minutes. ESCORT actually enables even a novice to create programs while learning. A tutorial mode takes the user through the process, step by step, explaining what's required.

Because the information content is defined by the user request, the user gets only the

Sperry Univac is a division and registered trademark of Sperry Corporation.



# SPERRY LINIVAC

#### We understand how important it is to listen.

information required. The computer gives you everything you asked for, not everything it has.

So you not only save time getting data, you save time

evaluating it.

The potential for application spans all departments, at all levels, from top management on down. ESCORT dispenses the information riches of the data base to each according to his need.

With or without ESCORT, System 80 is a superb mediumscale business computer. The fact is, it outperforms the competition, model for model, in most parameters of consequence. And as your needs expand, you can upgrade capabilities without replacing the entire system. That is not universally true in the industry.

The Sperry Univac System 80. Another demonstration of how we at Sperry define our products by the real-world needs of the people who use them. Another demonstration

of the value of listening.

We invite you to review the System 80's uncommon capabilities. Our "System 80 vs. IBM" and our ESCORT brochures are a good place to begin. Copies are yours for the asking from your local Sperry Univac marketing office.

Or call or write Sperry Univac, Department 100, P.O. Box 500, Blue Bell, PA 19424. Toll-free phone: 800-523-2496 (9 a.m. to 5 p.m.). In Pa. call collect 215-646-3378.

# **SYSTEM 80** ESCORT

#### **BYTELINES**

#### News and Speculation about Personal Computing

Conducted by Sol Libes

Random Rumors: It's rumored that Commodore Business Machines and some of its alternate suppliers are working on CMOS (complementary metal-oxide semiconductor) versions of the 6502 microprocessor (used in the Apple II, Atari 400 and 800, and Commodore personal computers) that would allow low-power operation.... One reliable source tells me that this year IBM plans to offer a high-resolution color video monitor for the Personal Computer that emulates IBM's 3279 terminal.... Word has it that Radio Shack will soon start selling the Casio handheld computer and drop one of the Sharp models it currently handles. . . . It is rumored that Apple Computer Inc. will shortly cut the price for the Apple II and Apple III by 10%.... Sharp is reportedly working on a computer based on Motorola's 68000 microprocessor that will provide a single-user Unix operating system, similar to the Fortune Systems 32:16.

hat's Going on at the Shack? It is now over half a year since Radio Shack introduced its 16-bit computer, the Model 16, with the promise of a three-user operating system running on the Motorola 68000 microprocessor housed within the unit. However, so far purchasers can run only the old TRS-80 Model II single-user 8-bit Z80 operating system and applications software. Rumors have been floating around that Microsoft was adapting its Xenix operating system for the Model 16. Now it turns out

that the operating system was really being developed by Rvan-McFarland and that Tandy later changed its mind and went to Charles River Data Systems for the multiuser operating system. Finally, it is expected that Tandy will also offer a single-user 16-bit operating system designed by Ryan-McFarland, in which case I wonder if there will be upward migration from the single- to multiuser systems.

Tandy reported that computer sales rose 69% for the last fiscal year, up to \$624 million from \$369 million, and that these sales now account for 31% of the company's business-back in 1978, computers accounted for only 2.4%. Further, Tandy claims that the TRS-80 Model II accounted for 25% of its computer sales; the Model III, 27%; the Color Computer, 7.2%; pocket computers, 2.5%; software sales, 8.5%; printer sales, 16.7%; and computer-related products. 12.2%. (It is strange that these percentages do not total 100%.)

Tandy also reported that gross profits as a percentage of sales were 59.3%—far higher than the norm for the electronics industry. Net profits were reported to be 11%. Radio Shack now has 392 computer centers and plans to open 125 more. It also sells computers through 5127 company-owned stores and another 2999 franchised outlets. The number of stores will increase by 170 this year.

t IBM: Rumors concerning IBM's future plans suggest that the firm intends to enter the portable-computer market with a "baby" Personal Computer system made outside the U. S. by Matsushita, that it is at the preproduction stage of a new 4-inch floppy-disk drive, and that it will introduce soon a 3270 IBM terminal emulator and RJE (remote job entry) package for the Personal Computer with an anticipated selling price of \$700. A highresolution color monitor is also expected that will allow the Personal Computer to emulate an IBM 3279 terminal. Because the Personal Computer costs less than IBM's series 327x terminals. which are used with IBM's large mainframe computers. doubtless customers of such systems will be switching to the IBM Personal Computer for their terminal needs.

IBM has also started selling enhancements for its Displaywriter desktop word-processor system that allow it to act as a terminal. Further, IBM now sells the p-System (Pascal language) for the Displaywriter for users who want it to function as a complete computer system. The Displaywriter uses an Intel 8086 microprocessor, and therefore it's strange that IBM doesn't plan to offer the MS-DOS and CP/M-86 operating systems for the unit, considering that these are available for the Personal Computer. Of course, concurrent CP/M-86 for the Displaywriter can be purchased directly from Digital Research. I can only wonder now if Microsoft will offer MS-DOS for the unit.

IBM offers one other desktop unit, called the System 23 Datamaster. It is the most expensive of IBM's small computers but uses an 8-bit

microprocessor (the Intel 8085, an enhanced version of the 8080). It's likely this processor was chosen because the Datamaster was introduced before the Displaywriter and the Personal Computer. The Datamaster offers much more disk storage capacity than either, however.

It seems likely that IBM will replace the Displaywriter and Datamaster with enhanced versions of the Personal Computer, probably using the new Intel 80286 processor (an enhancement of the 8086). Thus the next Displaywriter may be the Personal Computer with a display and keyboard better suited to word processing, and the next Datamaster may be a Personal Computer with larger disk storage. In this way, IBM could maintain upward compatibility through its entire line of desktop computers, terminal compatibility with its mainframes, and workstation compatibility with its new networking system. If this happens IBM will have the most comprehensive line of office-product computer systems in the industry.

In the meantime, IBM is due to introduce soon its hard-disk option (using the Seagate 51/4-inch drive) for the Personal Computer. Word is that the firm expects to sell about 300,000 this year alone. Also Tecmar, which develops peripherals and enhancements compatible with the Personal Computer, is reportedly planning to introduce a Winchester add-in using either one or two Syquest Technology 3.9-inch, 5-megabyte harddisk drives with removable media. This would be an ideal combination, allowing the

user to easily back up the IBM hard disk.

Recent advertisements from franchised IBM Personal Computer dealers have offered \$500 worth of free software with the purchase of an IBM Personal Computer, some are offering discounts of up to 15%, and some dealers are offering financing. This may suggest that supply and demand have begun to catch up with one another.

IBM has discovered that some of its franchised dealers. unauthorized dealers, and private entrepreneurs buy the minimum-priced 16K-byte version of the Personal Computer and add their own (much less expensive) memory and disk drives, then sell the full system either at list price or at a discount. A private entrepreneur can buy the minimum-priced 16K-byte machine with no disk drive for \$1250, add three additional banks of memory chips (for as little as \$10 each bank) and a Tandon disk drive (for about \$300), and resell the machine for about 10% below the \$2200 list price, making a \$400 profit, IBM is concerned because the purchaser is buying a machine where only half of the product's value is from IBM. The problem became apparent when purchasers took their machines in for repair to IBM service facilities. Perhaps IBM will take the tack Apple Computer Inc. considered when it was faced with the problem a few years ago: namely, sell only machines with full complements of memory and disk drives.

ommodore Dolngs: Atari has filed a federal suit charging Commodore Business Machines with infringement of Atari patents, designs, and trademarks for a joystick and paddle controller used in video games and computers. Commodore has launched a \$22 million advertising campaign to drum up sales for its Commodore 64 and VIC-20 personal computers. In the meantime. VIC-20s are selling like hotcakes, and Commodore is turning out 9000 per day with the expectation that 1 million will be sold by the end of June. With a list price of under \$200 and many merchandisers discounting to as low as \$159, it is far and away the lowestpriced computer available with color-video capability. Surely many consumers are buying the VIC-20 instead of a video-game unit because they can buy a computer and a game player for the same price as a games-only machine.

Several companies are supposedly planning to introduce emulators for the Commodore 64 that will allow it to run Apple II, Atari 400 and 800, and TRS-80 software. However, I would look very skeptically at such emulators for several reasons: first, emulators virtually always run much slower than the real thing, which could take all the fun out of many games. Second, many software authors often write clever program routines that depend on hardware specific to the system for which the software was designed: programs including such routines will not run properly with an emulator. Therefore, before buying an emulator, check its operation carefully to make sure it can do what you want.

ome Apple Bytes: Laser Microsystems, Corona, California, has announced that it is designing a plug-in processor card for the Apple II using the powerful new National Semiconductor 16032 16-bit microprocessor. Laser expects to introduce a Unix-

C714) 895 -1746 QUALITY 20MB HD INCLUDES FUJITSU H.D. WITH CABINET & POWER SUPPLY READY TO RUN WITH GODBOUT DISK II 1 YR LIMIT WARR 20 MEGABYTE H.D. & 8" DSDD FLOPPY IN CABINET WITH POWER SUPPLY FOR GODBOUT DISK ! & DISK !! 53399 NEALERS-we have ready to run hard & onfloppy disk sub-systems for GODBOUT Disk I &II systems-one low price-no minimums let us make you competitive-one year late, warranty GRATED BOOT&RUN LOW (Dealers -SYSTEMS INCL OPERATING SYSTEM & SPELLBINDER (TM) TELETEK 5". Z80.64K \$1995 W/ 8 MB HD 1 DR \$2995 TELETEK 8".Z80.64K 2495 W/ 8 MB HD 1 DR 3195 W/ 32 MB HD 1 DR 6195 LOMAS 8086.8".128K LOMAS 86, MPM-86(tm), 3825 V/ 32 MB HD 1 DR 6825 GODBOUT 85/88.256K, MPM 8-16(tm)(2)8"DSDD DR 5795 85/88.256K.MPM 8-16. (1)8" dr & 20 MB HD 8895 CPU Z.64X.(2)8" 2795 85/88.64K.(2)8" DISK 1 W/CPM \$445 DISK II W/ CPM \$596 CPU Z 199 10MHz 8086 OR 68000 \$638 Interfacer 4 LOMAS 8086 \$420 RAM 67 875 LDP72 W/CPM 86-415 SEATTLE CPU SET & MSDOS 671 SCP DISK CONTR 319 CP/M.MP/M ARE TM OF DIGITAL RESEARCH SPELLBINDER IS TH OF LEXISOFT MPM 8-16 TH OF GODBOUT ELECT

box 951 westminster ca 92683 0951



like operating system for the board (the company also expects to introduce IBM Personal Computer and TRS-80 versions later on).

On the marketing front, reports say that Apple is still having friction with its independent retail dealers. The most recent rub is Apple's new in-house national-accounts program to sell directly to the Fortune 1.000 companies, Second, despite many attempts. Apple has been unable to control sales by unauthorized discount retailers that are underselling authorized dealers. These discounters are believed to be obtaining their Apple IIs from authorized dealers who overbuy to get a better discount and then secretly reship at just a few dollars above cost. Apple says it will take strong action to cut off the supply lines to unauthorized dealers. In the meantime, the six West Coast mail-order dealers cut off by Apple over a year ago, who then filed suit against Apple, have not been able to get the government to take up their case.

f Clones and Look-Allkes: You can tell a really

successful product by how many "clones" (imitations) exist for it. For example, I know of two TRS-80 Model I/Model III clones currently sold, and Apple Computer Inc. is trying to stop the importation and sale of a number of clones from the Far East. Already about six IBM Personal Computer clones are made in the U.S., and at a Japan electronics show held this past October, Hitachi, Mitsubishi, NEC (Nippon Electric Company), Matsushita, Sanyo, and Toshiba all showed IBM-compatible systems, many of which will appear in this country later in the year. The question is whether a product is as compatible as its manufacturer claims it is. Many clone suppliers contend that, compared to the original, their product is far superior, contains added features, and gives you more value for your dollar.

You have to look closely at these claims because, in all too many cases, such statements conceal hidden snags. It may be that a clone maker cannot copy the original product exactly without violating some hardware patent or software copyright and thus has to get around this by changing part

of the design and calling the change an added feature. The net result is that the clone is not a clone but a lookalike-it may be able to run some of the software made for the original but not all of it; or, it may work with some of the plug-in peripherals but not all of them.

For example, one system that is advertised as IBMcompatible uses 3-inch floppy disks. Now how do you take a program supplied on an IBM Personal Computer 51/4-inch floppy disk and get it into this new machine? I suppose what the supplier probably means is that once you get a program onto the 3-inch disk, it will run on the company's com-

Another system is advertised as disk-compatible with the IBM Personal Computer. the Osborne 1 and the Xerox 820. Interpret this to mean that you can copy a file (or the whole disk) from one system's disk format to the other's. But how does the Personal Computer's 8088 program execute on the supplier's Z80-based system? And how does a program that uses the special I/O (input/output) features work on a system with different I/O procedures? What the manufacturer really means by "disk compatibility" is that many (but not all) data or text files can be converted from the original format to run on the "compatible" machine.

New companies entering the personal computer market will find their entry easier if they make their machines compatible with the dominant machines on the market. However, purchasers should look very closely at such compatibility claims to see if something less than 100% compatibility is offered and, if so, whether this will create problems.

Zilog to Sample Z800:

Word has it that Zilog will soon begin distributing samples of its new upgrade of the Z80, called the Z800, with production expected this fall. The Z800 will be upward compatible with the Z80 (in other words, it will execute a Z80 machine-code program) and will offer an expanded instruction set and enhanced performance features. Zilog is promising a three- to five-fold performance improvement. The processor will run at clock speeds as high as 25

# CompuPro 8 and lor 16 Bit

A CompuPro Systems Center is much more than a computer store: It is the first place to look for business, scientific, and industrial computing solutions. When you're ready for professional level, state-of-of-the-art microcomputing, turn to the professionals listed below...they're ready for you.

#### ACC

833 Steirlin Road #B110 Mountain View, CA 94043 (415) 969-4969

Advanced Information Mgt., Inc. 145 Kentucky Street Petaluma, CA 94952 (707) 763-7283

Byte Shop of Hayward 1122 B Street Hayward, CA 94541 (415) 886-4732

**Capacity Plus Computers** 250 Alamaha Street N-14 Kahului, Maui, HI 96732 (808) 877-3496

Comcen Technology Ltd. 45/46 Wychtree Street Morriston Swansea, U.K. SA68EX (0792) 796000

Computer Center, Inc. 1514 University Avenue Berkeley, CA 94703 (415) 845-6366

Gifford Computer Systems (division of G & G Engineering) 1922 Republic Avenue San Leandro, CA 94577 (415) 895-0795

Gifford Computer Systems 230 California Street #207 San Francisco, CA 94104 (415) 391-4570

MHz and will be capable of directly addressing up to 500K bytes of memory using an internal memory-management circuit with dynamic page relocation and memory protection. It will have modes for both system programs (this mode is meant to be used by programs performing operating-system functions that may access all registers) and user programs (this mode limits access to registers and prohibits execution of instructions that alter system status).

The expanded instruction set will include multiply and divide instructions (8 and 16 bits), will handle strings up to 64K-bytes long, will allow system calls at the machinecode level, and lots more. It also has more addressing modes and features suited to multiuser and multiprocessing environments. No doubt the Z800 will have a tremendous impact on the 8-bit market, significantly improving the operation of CP/M-80 singleuser systems and multiuser systems such as MP/M and TurboDOS. When the Z800 is coupled with version 3 of CP/M-80 (which is now called CP/M+), we can expect to see greatly enhanced singleuser systems.

CP/M+ Introduced:

Digital Research Inc. announced CP/M+ (the newest version of CP/M-80) at the Comdex show in December and is expected to start shipping copies to customers this month. This is the third major upgrade of the CP/M-80 disk operating system since its original development nine years ago. In all cases, Digital Research has maintained upward compatibility for software running under CP/M.

The first CP/M upgrade (version 1.4, introduced in 1976) took what was a barebones DOS (disk operating system) and made it suitable as a general-purpose development system. Version 2 (1979) overcame many of the limitations of the earlier versions and improved CP/M's operation for more sophisticated application programs, larger memory, and larger mass-storage systems.

CP/M+ has been enhanced for the newer generation of 8-bit computers with banked memory systems having upwards of 1 megabyte of memory and very large hard-disk systems. Further enhancements speed up transfers between memory and disk storage, and error-handling

has been improved. CP/M+ is also furnished with a greatly expanded set of utility files (such as a Help program). However, many of these utilities appear to have been available previously for the earlier versions via CP/M user-group libraries.

CP/M+ still retains what is without doubt CP/M's greatest asset: a modular structure that allows programmers to implement the system on virtually any hardware system that executes Intel 8080 machine code. The BIOS (basic input/output system) module, written by the system programmer, contains all the hardware drivers and software interfaces to the CCP (command control program) and BDOS (basic disk operating system) parts of CP/M. It should be noted that CP/M+ has a greatly increased number of BIOS and BDOS calls for the added features. The generating of the actual CP/M+ system program for a user's computer (what programmers call the system procedure) is much more complicated and hence more difficult to create than under previous versions. A program is supplied by Digital Research to help the system programmer generate CP/M+ properly. Also, CP/M+'s added features take up 4K bytes more of memory space; this should prove to be no problem because CP/M+ is intended to run on systems with memory expanded far beyond 64K bytes.

Battle of the DOSes:

Digital Research Inc. assuredly has the 8-bit single-user DOS market sewn up with CP/M-80, and the new version will ensure that this position is maintained for a long time to come. However, the multiuser and 16-bit fields appear to be up for grabs. While Digital Research's MP/M is a multiuser version of CP/M that allows users to run CP/M applications programs in a multiuser environment, the system is based on a singleprocessor system architecture and allocates a maximum of 48K bytes of memory space to each user. Some time ago, Software 2000 of Arroyo Grande, California, released TurboDOS-a CP/M-compatible DOS that performs disk buffering for better performance and allows print spooling so the user can go on

# Spoken Here...

JR Systems, Inc. 8227 Woodmont Avenue #200 Bethesda, MD 20014 (301) 657-3598

Key Microsystems 978 Tiogue Avenue Coventry, RI 02816 (401) 828-7270

Key Microsystems 822 Boylston St. Chestnut Hill, MA 02167 (617) 738-7305

Logic Systems 4800 Manzanita Avenue #21 Carmichael, CA 95608 (916) 971-3133 Matrix Computer Systems 720 Mendocino Avenue Santa Rosa, CA 95401 (707) 542-0571

Micro Computer Technology 1549 W. Brandon Boulevard Brandon, FL 33511 (813) 685-7659

Pragmatic Designs, Inc. 950 Benicia Avenue Sunnyvale, CA 94086 (408) 736-8670 Telex: PRAGMATIC-171627 Priority One Electronics 9161 Deering Avenue Chatsworth, CA 91311 (800) 423-5922. (213) 709-5464 S-100 Inc. 14425 N. 79th St. #B Scottsdale, AZ 85260 (800) 528-3138, (602) 991-7870



CompuPro division, Godbout Electronics, Box 2355, Oakland Airport, CA 94614

with other tasks while the system sends data to the printer. A software module is available that allows multiple processors to be connected via any number of network configurations so that each user can access the resources of any others. (Software protection can also lock resources to make them inaccessible.) This system is presenting a serious challenge to MP/M in the 8080/Z80 multiuser/multitasking marketplace. Further, it is likely that other software houses may introduce similar packages.

The 16-bit market as yet has no definite leader, although Microsoft with MS-DOS currently appears to be the chief contender. When the first 8086-based personal computer was introduced by Seattle Computer Products (SCP) back in 1979, there was no software for it. Digital Research was working on CP/M-86, but it was a lowpriority project. Microsoft, however, created a version of BASIC in 8086 code, so SCP started furnishing BASIC with its system and wrote a DOS. A year later, Digital Research finally introduced CP/M-86 just as other vendors started to introduce 8086-based systems, CP/M-86 and SCP-DOS, although very similar in structure and operation, were not compatible.

When IBM went looking for a disk operating system for the Personal Computer, the company approached Digital Research but for some reason didn't hit it off. Because IBM was also negotiating for Microsoft's BASIC, Microsoft quickly obtained the rights to SCP-DOS and adapted it to the Personal Computer. Microsoft renamed it MS-DOS and licensed it to about two-dozen other hardware vendors.

Microsoft will soon introduce version 2 of MS-DOS to overcome some of the limitations of the first version,

provide more features, and achieve upward compatibility with Microsoft's Xenix, a multiuser/multitasking DOS based on the Unix operating system and licensed from Bell Laboratories. Digital Research has introduced a multitasking version of CP/M-86; however, with IBM using MS-DOS (IBM calls it Personal Computer DOS) as its principal operating system (the company also offers CP/M and the p-System at significantly higher cost) it's very likely that, in the 16-bit market at least, MS-DOS will dominate. What makes a DOS successful is the software available to run under it. It appears to me that there are far more software houses developing software to run under MS-DOS than under CP/M-86. Most 8086 hardware suppliers appear to be hedging their bets by furnishing both operating systems.

Vall-Order Sales to Stop: Following in the footsteps of Apple Computer Inc. and Hewlett-Packard, two software suppliers are trying to stop mail-order sales of their products. Micropro International (creator of Wordstar, et al.) of Sausalito, California, and TCS Software. Houston, Texas, have notified dealers that they must cease mail-order sales and sell only to customers to whom they can provide post-sale support. Micropro is believed to have as many as 100 mailorder dealers. Considering the difficulty Apple has had trying to cut off mail-order sales, it will be interesting to see how successful software suppliers will be in this effort.

**ntel Profile:** Founded only 14 years ago, Intel Corporation has proved to be one of the most innovative companies in the microcomputer field. It has a long string of

firsts: the first practical dynamic RAM, the first microprocessor, the first EPROM. the first 1K-bit static RAM, the first 8-bit microprocessor, the first 32-bit microprocessor, and the first singlechip microcomputer. It now employs nearly 17,000 people and does close to \$1 billion of business. This year, Intel is expected to introduce a 256K-bit EPROM, a 64K-bit EEPROM, and a 4-megabit bubblememory device (a 16-megabit device is expected next year). A 1-megabit dynamic RAM is also in development (imagine a full 64K bytes in one integrated circuit).

In the microprocessor field, Intel expects to introduce a new 32-bit microprocessor called the 80386 (or iAPX386) that is upward compatible with the 8086 family. Intel will also start shipping the 80286, an enhanced 8086 with virtual-memory ability. We can expect to see a version of this device with 8-bit I/O also. The current iAPX-432 32-bit microprocessor is also due for an upgrade in microcode and interconnection capabilities to improve its throughput. It is also expected that the new 432 will be able to handle gigabytes of memory. Intel is also known to be doing research in speech recognition; however, introduction of any devices in this area still appears to be several years off.

## A Unix Status Report:

My son (who is quite familiar with the Unix operating system) and I recently conducted a survey of Unix-like operating systems for microcomputers. We canvassed 35 companies selling such operating systems for microcomputers and discovered the following: four companies sell Unix-like operating systems for 8-bit systems; two are for 6809 systems and two for Z80 systems. All but one provide multitasking and multiuser facilities.

Further, utilities are available that run on CP/M-based systems and provide many Unixlike facilities such as I/O redirection and hierarchical file system.

An incredible number of software houses are now supplying Unix-licensed and Unix-like operating systems for 16-bit microcomputers. The most popular version is for Motorola's 68000, second is for Zilog's Z8000: less popular are versions for the Intel 8086 and the National Semiconductor 16032, the latter probably because it is so new. Virtually all of these operating systems require large memories and hard-disk systems. Although almost all of these systems provide the basic features of Unix, most are lacking features such as virtual-memory management. Many lack process- and memory-management features common on standard minicomputer Unix systems.

Also, Unix systems typically have good program development and text processing support. However, you may have to pay extra for anything other than the minimum with these systems. Nearly every vendor charges extra for languages such as BASIC, Pascal, FORTRAN, and COBOL. Some even charge extra for a C compiler (Unix is written in C). Further, none offer a highlevel debugger (sdb is the standard utility that Unix programmers use for debugging C programs). Lack of a debugger certainly makes program development more of a hassle and more time consuming. It's interesting that three suppliers provide CP/M emulators that run as a task under Unix.

ew Machine Goes to Hollywood: Tracy Kidder's book *The Soul of a New Machine* (Little, Brown, 1981) won a Pulitzer prize for general nonfiction, and now Columbia Pictures has taken

an option on it to possibly make it into a movie. The book describes in a very human way the struggle to develop the Data General MV-8000 32-bit super minicomputer.

he Software Stars: Which are the three top-selling microcomputer software packages to date? If you guessed Microsoft BASIC, CP/M, and Visicalc, give yourself a gold star. Microsoft BASIC, which is now running on more than 1 million microcomputers, is the top seller. Originally written in 1975 by Bill Gates and Paul Allen to run on the MITS (management information and text system) Altair 8800 computer, it is today available on virtually every major microcomputer system and is considered the standard for BASIC interpreters. It has been implemented on some large computers. Second in popularity is the CP/M disk operating system currently running on over a half-million microcomputers and more than 600 different systems. Written by Gary Kildall in 1974, its first appearance was on the IMSAI 8080 microcomputer system in 1976. Third is Visicalc, written for the Apple II computer in 1979 by Dan Bricklin, Bob Franston, and Steve Lawrence; it has already sold over 300,000 copies and is currently available for many other systems as well.

All three packages were developed on large computer systems by pioneering individuals working outside of commercial organizations. They did not perceive the broad-based acceptance that their efforts would receive, and at the time they didn't realize that within a few years they would be leaders of large companies employing a hundred or more people and grossing many millions of dollars each year.

Shakeout Predicted: Currently several hundred microcomputers are on the market, all based on a mere handful of microprocessors, operating systems, and application programs. Therefore, many of the systems are nearly identical inside and out. Yet there is a limited amount of dealer shelf space on which to show them, creating a bottleneck at the retail level. System suppliers have tried to become much more aggressive in their marketing, but only the better-financed and established companies are succeeding. Add to this the current recession, and it's no surprise that industry pundits are predicting a shakeout among personal computer manufacturers in the very near future as marketing becomes more important than the products themselves.

**W** hat's New In Video Games7: Mattel and General Instrument Corporation have announced a new venture called Playcable that will allow owners of Mattel Intellivision units to access games via cable-television systems, Control Video Corporation of Washington plans a similar service, to be accessed via the telephone lines. for Atari 5200 game owners. Meanwhile, Compuserve is offering games that can accommodate up to 10 players at a time. Compuserve claims that one game, called Megawars, is its second largest revenue producer, attracting 2000 players a week at a rate of \$5 per hour. X-rated games are also becoming quite an attraction in bars and even at home.

Gross income from arcade games has skyrocketed in the last few years but appears to have leveled off at about \$8 billion (yes, billion) and arcade-game suppliers are searching for new ways to increase game playing. Thus

under development and due shortly on the arcade scene are games using videodiscs and three-dimensional games in which the enemy appears to be hurtling objects directly at the player. The videodisc creates more life-like pictures and sound, with explosions that are more like the real thing. Atari has already demonstrated a prototype game using holography to create ghost-like threedimensional images. There is no word on whether the firm actually plans to produce it.

Random News Bits: Radio Shack has cut the price of its Color Computer from \$399 to \$299, no doubt to be more competitive with Commodore, Texas Instruments and Atari. . . . Comprocsys Ltd, 1 Branch RD, Park St., St Albans AL1 4RJ, England, is selling a ROM for the ZX81 that turns that \$99 machine into a development system with full-screen editor, multifile operating system, assembler, debugger, and more. . . . Intel appears to be the first company to meet the Department of Defense specifications for its comprehensive subset of the Ada language. . . . Hewlett-Packard has established a new Personal Office Computer division in Sunnyvale, California, that will be separate from the Personal Computation group, which produces the company's current line of personal computers. . . . Users of Compuserve will soon be able to use the U. S. Postal Service E-COM (Electronic Computer Originated Mail). Unfortunately, it is only available to business users. . . . NEC claims to have developed a software technique for recognizing handwritten characters with 99.5% accuracy.■

MAIL: I receive a large number of letters each month as a result of this column. If you write to me and wish a response, please include a selfaddressed, stamped envelope.

Soi Libes c/o BYTE Publications **POB 372** Hancock, NH 03449 ■

## **BYTE's Bits**

## Articles on Computers and **Writing Sought**

The Writing Instructor is a quarterly journal on teaching composition. The theme of the Summer 1983 issue will relate computers to writing instruction. Authors are encouraged to submit articles about computer-aided instruction, the use of word-processing and interactive computer programs for composition, personal classroom experiences using computers in writing instruction, computeraided assessment of student tests, and speculative or reflective essays on the implications of computers in the

humanities.

Articles should be no longer than 15 double-spaced typewritten pages. You may use internal documentation whenever practical: otherwise, use the MLA Handbook. Submit two copies of your manuscript along with pertinent biographical information and a stamped, self-addressed envelope to The Writing Instructor, c/o The Freshman Writing Program, University of Southern California, Los Angeles, CA 90089, Attn: Randall Adams, Issue Editor, Summer 1983.■

## **Event Queue**

## February 1983

February

Continuing Engineering Education, George Washington University, Washington, DC. Among the courses being offered are "Selecting Small Computers for Business and Government," "Local Communication Networks and Digital PBXs." and "Computer Communications Systems and Networks." Course fees range from \$685 to \$855. Further details are available from Douglas Green, Continuing Engineering Education, George Washington University. Washington, DC 20052. (800) 424-9773; in the District of Columbia, (202) 676-8515.

February

Seminars of Interest to Women Professionals, various sites in the New York City and Boston metropolitan areas. This series of one- and twoday seminars is presented by Boston University Metropolitan College. Among the topics on the agenda are "Tactical Innovations in Marketing Management," "Sales Management for Today's Newly Promoted Sales Manager," and 'Data Processing Fundamentals for Accounting and Financial Managers." The seminar fees are \$325 and \$495, depending on duration. For registration information, contact Ms. Joan Merrick, University Seminar Center, Suite 415, 850 Boylston St., Chestnut Hill, MA 02167, (617) 738-5020.

February-March

Courses for Developers and Users of Computer Systems, various sites throughout the U.S. Among the courses being offered by the AMA (American Management Associations) are "Fundamentals of Data Processing for the Nondata Processing Executive,"

"BASIC: A Computer Language for Managers," and "Database Concepts and Design." For complete registration and course information, contact the AMA, 135 West 50th St., New York, NY 10020, (212) 586-8100.

February-June

Intensive Seminars of Interest to Data Processing Professionals, Boston metropolitan area. Among the two- to five-day seminars offered are "Project Management" and "Data Communications." Registration fees range from \$495 to \$975. For a seminar bulletin, contact Ms. Ginny Bazarian, Office of Continuing Education, Higgins House, Worcester Polytechnic Institute, Worcester, MA 01609, (617) 793-5517.

February-June

Seminars in Simulation, Management, Statistics, and Computer Science, various sites throughout the U.S. "Simulation Modeling for Decision Making," "Database Design," and "Satellite Communications Technology" are some of the topics to be presented. For details, contact the Institute for Professional Education, POB 756, Arlington, VA 22216, (703) 527-8700.

February 14-18

Auditing in the Contemporary Computer Environment, New York, NY. This course is designed for internal auditors and financial and data-processing professionals. It provides a comprehensive audit approach for computerbased systems, including how to evaluate controls and how to design a program of tests using questionnaires, checklists, software tools, and flow charts. For details, contact Marge Umlor, EDP Auditors Foundation, 373 South Schmale Rd., Carol Stream, IL 60187.

February 15-18

Embedded Computer Systems, Boston, MA. Participants in this course will learn how to design reliable and fault-tolerant systems, how to implement real-time and interrupt-driven controls, and how to evaluate bus structures, protocols, and networking. The registration fee is \$845. For details, contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (213) 450-2060.

February 15-18

Peripheral Array Processors for Signal Processing and Simulation, University of California, Los Angeles. The fee for this course is \$845. Contact Marc Rosenberg at the UCLA Extension, Continuing Education in Engineering and Mathematics, 6266 Boelter Hall, Los Angeles, CA 90024, (213) 825-1047.

February 15-18

Designing Real-Time Hardware for Digital Signal and Image Processing, Washington, DC. Participants in this short course will learn how to implement digital filters, fast Fourier transforms, correlation, modulation, and other real-time processes by designing with general-purpose 16-bit microprocessors. Case histories and lectures will be featured. The fee is \$845. For further details, contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (213) 450-2060.

February 16-18

The Third Annual TALMIS, Ambassador West, Chicago, IL. This conference brings together software publishers and users of microcomputer-based training systems. Issues on the agenda include the home market, local networking, new hardware, and successful distribution channels. Questionand-answer sessions will be held. Further information is available from Mary O'Keefe, TALMIS Inc., 115 North Oak Park Ave., Oak Park, IL 60301, (312) 848-4000.

February 16-19

Data and Telecommunications/Japan Exposition '83, Tokyo Ryutsu Centre, Tokyo, Japan. For information, contact Cahners Exposition Group, Cahners Plaza, 1350 East Touhy Ave., POB 5060, Des Plaines, IL 60018, (312) 299-9311. In Japan, contact Cahners Exposition Group S.A., Hino Building 3F, 3-4-11 Uchikanda, Chiyoda-ku, Tokyo 101, Japan; tel: 03-254-6041.

February 21-23

Office Automation Conference, Civic Center, Philadelphia, PA. More than 200 exhibitors are expected to participate in this conference. Fifty technical sessions will explore such topics as current and advanced office technology and human factors and social issues. Further details are available from the American Federation of Information Processing Societies Inc., 1815 North Lynn St., Arlington, VA 22209, (703) 558-3624.

February 22-26

The Eighteenth Annual Bias-Microelettronica '83, Milan, Italy. This international exhibition is expected to attract more than 80,000 visitors. Areas of interest include active and passive components, instrumentation and equipment for component manufacturing, laboratory instrumentation, microcomputers, peripherals, and telecommunications systems. For information, contact Ente Italiano Organizzazione Mostre, Bias-Microelettronica '83, Viale

Premuda 2, 20129 Milan, Italy: tel: 796.096: Telex: CONSEL 334022.

February 23-25

Microcomputers in Education, New York, NY. This hands-on workshop is designed for teachers and administrators. Topics on the agenda include Logo, Pascal, microcomputers as laboratory instruments, and microcomputers in mathematics and science. Fees range from \$120 to \$300, depending on length of participation. For full details, contact Technical Education Research Centers Inc., 8 Eliot St., Cambridge, MA 02138, (617) 547-3890.

February 24-25

Computers in Construction, San Diego, CA. This seminar is designed to assist construction contractors and construction management firms in acquiring computer systems. The registration fee is \$395. For further information, contact CIP Information Services Inc., 1105-F Spring St., Silver Spring, MD 20910, (301) 589-7933.

February 25-27

The Second Annual Computer Expo '83, Tupperware Convention Center, Orlando, FL. This exposition focuses on hardware, software, word processing, graphics, peripherals, supplies, services, and computer furnishings for mini- and microcomputers. Seminars will be held. For details, contact Tom Blayney, POB 1185, Longwood, FL 32750, (305) 339-1731.

#### March 1983

March

Continuing Engineering Education Courses. George Washington University, Washington, DC. Among the courses being offered are 'Managing Data Processing Systems in Multiproject Environments" and "Design of Digital Control Systems." Fees range from \$685 to \$855. Further details are available from Douglas Green, Continuing Engineering Education, George Washington University, Washington, DC 20052, (800) 424-9773; in the District of Columbia. (202) 676-8515.

March 1-4

Computer Network Design and Protocols, Washington, DC. This short course emphasizes the practical aspects of network design, interfacing, protocols, and packet switching. Topics include how to determine system requirements, how to use packet- and message-switching techniques, and how to interface local systems to value-added networks. The fee is \$845. For more information, contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (213) 450-2060.

March 4-5

Conference on Computer Technology: The Challenge to Business and Industry, Brown University, Providence, RI. Plenary addresses and seminars will focus on such topics as future technology and applications, robotics, and training and education requirements. For additional information, contact the Conference on Computer Technology, Registration Office, AIESEC Box 1930, Brown University, Providence, RI 02912, (401) 861-4835.

March 7-11

Computer-Aided Engineering and Manufacturing: Seminars and Exhibition, McKimmon Center. North Carolina State University, Raleigh. This comprehensive program is de-

## In Less Than 3 Minutes

Your IBM Model 50, 60, 65, 75, or 85 **Electronic Typewriter** can be an RS232C PRINTER or TERMINAL



CALIFORNIA MICRO COMPUTER Models 5060 and 5061 can be installed easily and require NO modifications to the typewriter.

For additional information contact:

CALIFORNIA MICRO COMPUTER 9323 Warbler Ave., Fountain Valley, CA. 92708 (714) 968-0890



signed to update manufacturing managers, engineers, and professionals on the capabilities of computers, microprocessors, robotics, and CAD/ CAM (computer-aided design/ manufacturing) systems through discussions, hands-on experience, and demonstrations. For further information. write to Robert Edwards. Industrial Extension Service. North Carolina State University, POB 5506, Raleigh, NC 27650.

March 8-9

ACM SIGCOMM '83-Symposium on Communications Architectures and Protocols. University of Texas, Austin. This symposium is sponsored by the Association for Computing Machinery. Address inquiries to Rebecca Hutchings, Honeywell/FSD, 7900 Westpark Dr., McLean, VA 22102. (703) 827-3982.

March 8-10

Semicon/Europa '83, Zuespa Convention Center, Zurich, Switzerland. The Semiconductor Processing and Equipment Symposium will include technical papers and exhibits on such topics as process-related defects, pattern definition, and process chemistry. Full details are available from the Semiconductor Equipment and Materials Institute Inc., Suite 212, 625 Ellis St., Mountain View, CA 94043, (415) 964-5111.

March 8-11

Distributed Processing, Mini and Microcomputer Implementations, Washington, DC. This course is designed to provide a comprehensive introduction to distributed processing hardware and software. Topics of interest include unique design requirements of distributed systems and how

to partition systems tasks and hardware. The fee is \$845. Further details are available from Ruth Dordick. Integrated Computer Systems, 3304 Pico Blvd., POB 5339. Santa Monica, CA 90405. (213) 450-2060.

March 8-11

Local Area Networks, Los Angeles, CA. This course focuses on the practical integration of available software and hardware elements, based on an understanding of network architectures and protocols. The fee is \$845. For further details, contact Ruth Dordick, Integrated Computer Systems, 3304 Pico Blvd., POB 5339, Santa Monica, CA 90405, (213) 450-2060.

March 9-11

Secretary Speakout '83. Sheraton Hotel, Boston, MA.

The theme for this symposium is "The Professional Secretary's New Identity in the Information Age." Speakers will address the impact of office technology through case history presentations, panels, open microphone sessions. and discussion groups. This event is sponsored by the Professional Secretaries International Research and Educational Foundation. Full details are available from Candace M. Louis, PSI, Crown Center G-10. 2440 Pershing Rd., Kansas City, MO 64108, (816) 474-5755.

March 12-17

The Twenty-fourth Annual Management Conference of the Electronic Representatives Association, Cancun, Mexico. Educational programs, special meetings, round-table discussions, and workshops will highlight this annual event.

THE ULTIMATE SOFTWARE PACKAGE FOR YOUR CPM MACHINE

WORDSTAR MAILMERGE

MPM.HAL DATABASE

(REFFERENCE CARDS INCLUDED)

THIS IS A LIMITED OFFER-DRDER NOW

MONEYORDER, COD, CREDITCHRD DRDERS SHIPPED WITHIN 24 HRS PERSONAL CHECKS TAKE ID DAYS (MANUALS NOT INCLUDED )

VON 2578-6725 NOW

OR SEND YOUR ORDER TO:

HAL SOFTWARE BROKERAGE P.O.80X 6051

EL PRSO TEXAS 79906-6051

TEXAS RESIDENTS RDD 5% SRLES TRX





WHEN HAL SPEAKS 2001 LISTENS

## **PUT PRICES IN CHECK**

ZIP PACK RELOAD RIBBONS FOR

**NEC 8023A** APPLE PRINTERS

C. ITOH PROWRITER

CARTRIDGE RIBBONS FOR **EPSON** 

MX-80 MX-100 **\$7**.99 \$12.95

\$89.99 DOZ.

\$**139**.86 DOZ.

MEMOREX DISKETTES

51/4 SINGLE SIDE - DUAL DENSITY

10 PACK

LABEL SPECIAL

(5K/MIN.)

ACROSS 31 x 15/16 CONTINUOUS LABELS

COMPLETE LINE OF OTHER RIBBONS AVAILABLE. PLEASE CALL

51 DIAUTO DR. P.O. BOX 103 RANDOLPH, MA 02368

TOLL FREE 800-343-7706 IN MASS 617-963-7694

WE ACCEPT MASTER CARD & VISA MASS. RESIDENTS ADD 5% SALES TAX PHONES OPEN 9AM-7PM FASTERN TIME

Contact the Electronic Representatives Association, 20 East Huron St., Chicago, IL 60611, (312) 649-1333.

March 14-15

The Seventh Annual Conference of the Michigan Association for Computer Users in Learning—MACUL '83, Hyatt Regency, Dearborn, MI. Sessions and speakers will highlight this conference. For more information, contact Betty VandenBosch Shaw, Coordinator of Mathematics, Flint Community Schools, 923 East Kearsley, Flint, MI 48502, (313) 762-1007.

March 14-17

The Seventh Annual Federal Office Systems Expo—FOSE '83, Washington Convention Center, Washington, DC. Sixty high-level sessions will cover the development of integrated office systems in both government and industry. More than 200 companies will display the latest in office systems technology. For more information, contact Mary Beth Gouled, National Trade Productions Inc., 9418 Annapolis Rd., Lanham, MD 20706, (800) 638-8510; in Maryland, (301) 459-8383.

March 14-18

Computer Graphics Applications for Management and Productivity-CAMP '83, International Congress Center, Berlin, West Germany. This conference features tutorials, technical papers, and exhibits that reflect the practical applications and state of the art of computers and computergraphics technology. Topics on the agenda include computer-aided design and manufacturing, sales-support graphics, and improving the use of engineering data. A hardware and software exhibition will be held. Full particulars are available from the World Computer Graphics Association, Suite 250, 2033 M St. NW, Washington, DC 20036, (202) 775-9556.

March 15-16

Selecting a Microcomputer for Scientific and Engineering Applications, Colorado School of Mines, Golden, CO. This short course reviews hardware and software technology for potential buyers of microcomputers in relation to specific scientific and engineering applications. The fee is \$195. Contact the Space Office, Colorado School of Mines. Golden, CO 80401, (303) 273-3321.

March 15-18

Distributed Processing, Mini and Microcomputer Implementations, San Diego, CA. For details, see March 8-11.

March 15-18

Local Area Networks, Boston, MA. For details, see March 8-11.

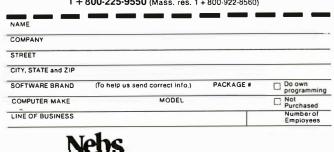
March 16-17

Business-Expo, Houston, TX. This show features everything from computers, copiers, and telephone equipment to interior decorating, office design, and financial consulting. More than 20 seminars on business technologies will be offered. Complete details are available from Business-Expo, 702 East Northland Towers, 15565 Northland Dr., Southfield, MI 48075, (313) 569-8280.

March 17-19

The Third Annual Microcomputers in Education Conference, Arizona State Universi-





**CODE** 11004 78 Hollis Street, Groton, Massachusetts 01471 A division of New England Business Service, Inc.



ty, Tempe. The theme for this conference is 'Forward to the 3 C's: Communicating, Calculating, and Computing," Demonstrations, workshops, and presentations will emphasize the potential of computers to revolutionize the learning process. Topics to be explored include how computers are changing the nature of: content in subject areas, teaching, and what it means to be well educated. University credit will be available. Further information can be obtained from Marilyn Sue Ford, B-47 Payne Hall, College of Education, Arizona State University, Tempe, AZ 85287, (602) 965-7363.

March 18-20

The Eighth West Coast Computer Faire, Civic Auditorium and Brooks Hall, San Francisco, CA. Attendance this year is expected to reach 40,000. More than 600 ex-

hibitors and a wide assortment of seminars make this one of the largest annual computer shows. For more information, contact The Computer Faire, 333 Swett Rd., Woodside, CA 94602, (415) 851-7075.

March 21-24

Interface '83, Miami Beach Convention Center, Miami, FL. This conference will cover all aspects of data communications and information processing in technology, management, policy, and strategy. It is cosponsored by McGraw-Hill's Business Week and Data Communications magazines. For further details, contact The Interface Group, 160 Speen St., POB 927, Framingham, MA 01701, (800) 225-4620; in Massachusetts. (617) 879-4502.

March 21-24

Personal Microcomputer In-

terfacing and Scientific Instrumentation Automation, Virginia Polytechnic Institute and State University, Blacksburg, VA. This is a hands-on workshop where the participant designs and tests concepts with the actual hardware. The fee is \$595. For more information, contact Dr. Linda Leffel, C.E.C., Virginia Tech, Blacksburg, VA 24061, (703) 961-4848.

March 22-24

Cincinnati Business Show, Exhibition-Convention Center, Cincinnati, OH. A wide range of products and services will be displayed, including computers, satellite equipment, electronic mail systems, and telecommunications equipment. For more information, contact Ray G. Nemo, Cincinnati Business Show, 10608 Millington Court, Cincinnati, OH 45242, (513) 791-6300.

March 22-25

Computer Network Design and Protocols, San Diego, CA. For details, see March 1-4.

March 22-25

Embedded Computer Systems, Washington, DC. For details, see February 15-18.

March 24-25

Computers in Construction, Orlando, FL. For details, see February 24-25.

March 24-25

The Western Educational Computing Workshops, Hayward, CA. These workshops, sponsored by the California Educational Computing Consortium, provide demonstrations and hands-on experience with new computer applications, software, and hardware. Contact Jerry Rose, Computer Center, California State University,

# The Byte Shop® Franchise Opportunity.

Computer retailing has survived the economic hard times like no other industry: with phenomenal growth

Computer Retailing: The growth industry of the 1980s Just wait until the economy gets hot!

That's why this is a good time to consider the Byte Shop® opportunity.

If you are motivated

to make a commitment to success in the computer retailing industry, you owe it to yourself to evaluate the Byte Shop® Franchise prospectus. Cash required: \$60,000. Franchise fee only \$10,000.

Just call or Write. 21130 Cabot Boulevard Hayward, CA 94545 415/783/8272



| 415/783/82/2                                            |  |
|---------------------------------------------------------|--|
| Name                                                    |  |
| Company                                                 |  |
| Address                                                 |  |
| City/State/Zip                                          |  |
| Phone                                                   |  |
| Byte Shop is a registered trademark of Byte Industries. |  |

# DECADES OF SERVICE Washington Computer Services

97 Spring St., New York, NY 10012

affiliate of (((WASHINGTON))) est, 1912

**TO ORDER:** Call our toll-free number: **(800) 221-5416.** In N.Y. State and for technical information: **(212) 226-2121.** Hours: 9 AM-5:30 PM (EST) Monday–Friday **TELEX: 12-5606 CABLE: WASHCOMP NYK** 



The Professional's Workstation

## NEC APC

8086. 16 bit processor; Two 8" DSDD disk drives; 128K RAM (to 256K); green or RGB PERFECT FOR: color screen. Word Processing CAD/CAM graphics (1024 ×1024 resolution) DataBase Management Accounting Chang Lab's Microplan IBM emulations CP/M-86, MSDDS, UCSD P.

# This new state-of-the-art work station out-performs all others near its price range. State-of-the-art work station out-performs all others near its price range.

NEC COMPUTERS AND MONITORS

On N.Y.S. Contract #P-07220

PLEASE! Do not confuse us with mail order dealers. We are a full service distributor serving the data processing & installation needs of business & industry from micros to mainframes. System houses, educational institutions & governmental agencies given special consideration. Leasing available. N.Y. State agencies, municipalities, and schools—call us for information on our 0.6.S. term contracts on hardware & software.

Please call to make an appointment for demonstration of this extraordinary computer at our showroom. Prices subject to change without notice; call for latest prices. Prices include 3% cash discount. N.Y. residents add sales tax. CP/M or is a trademark of Digital Research. All sales subject toour standard sale conditions (available on request). Above prices do not include customization or installation. 25800 Hillary St., Hayward, CA 94542.

March 24-25

Workshop on Performance and Evaluation of Local Area Networks, Worcester, MA. This workshop will seek to increase interaction and communications between active researchers and systems developers on the performance and evaluation of local-area networks. Contact T. C. Ting, Computer Science Department, Worcester Polytechnic Institute, Worcester, MA 01609. (617) 793-5670.

March 25

Communication Aids and Computers: A Voice for the Non-Vocal. Stokes Auditorium, Children's Hospital, Philadelphia, PA. This conference will present recent advances in technology, methodology, and research as they relate to computers and speech technology. Sessions will include lectures, videotapes, and equipment demonstrations. The registration fee is \$75 (if postmarked prior to March 4, 1983, the fee is \$65). This conference is sponsored by the Children's Seashore House and the Division of Child Development and Rehabilitation of the Children's Hospital of Philadelphia. For further information, contact Joan Bruno, Chief Speech Pathologist, Children's Seashore House, 4100 Atlantic Ave., Atlantic City, NJ 08404, (609) 345-5191, ext. 205.

March 25-27

Fantasylair '83, Tonkawa High School, Tonkawa, OK. This annual spring gaming convention is sponsored by the Northern Oklahoma Dungeoneers. It features fantasy and war games, tournaments, a costume contest, seminars, and prizes. The admission is \$3 per day; group discounts are available. For information, contact the Northern Oklahoma Dungeoneers,

POB 241. Ponca City, OK 74602, (405) 762-0349,

March 28-31

National Design Engineering Show and Conference, Mc-Cormick Place, Chicago, IL. The conference is sponsored by the American Society of Mechanical Engineers' design engineering division. It will run concurrently with the National Plant Engineering and Maintenance Show and Conference. Details are available from Clapp & Poliak Inc., 708 Third Ave., New York, NY 10017. (212) 661-8410.

## **April 1983**

April 5-8

Computers/Graphics in the Building Process, Convention Center, Washington, DC. The focus will be on the needs of private sector and federal users for computer/graphics applications in architecture, engineering, design, planning, and management of the building process. America's top 400 construction contractors and 500 leading design firms are expected to attend the tutorials, exhibits, and technical and management sessions. This event is cosponsored by the National Academy of Sciences' Advisory Board on the Built Environment (ABBE) and the World Computer Graphics Association (WCGA). For details, contact the WCGA, Suite 399, 2033 M St. NW, Washington, DC 20036, (202) 775-9556.

Distributed Processing, Mini and Microcomputer Implementations, Boston, MA. For details, see March 8-11.

Anril 5-8

The Second Annual Convention and Exposition of the Electronic Funds Transfer Association—EFT Expo, Riviera Hotel, Las Vegas, NV. Gen-

## **Huntington's** Disease... **The Genetic** Time Bomb!



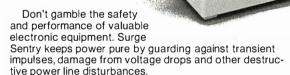
HUNTINGTON'S DISEASE ASSOCIATION

Suite 501, 1441 Broadway, New York, N.Y. 10018

79-11

THIS SPACE CONTRIBUTED BY THE PUBLISHER

Kill surges fast as lightning Surge Sentry... for pure power



Surge Sentry:

- Clamps transient impulses in picoseconds
- Dissipates 1,000,000 watts in 100 microseconds
- Maintains its speed and performance without deterioration
- Gives visual indication of proper operation
- Is UL and CSA listed (most models)
- Has a one-year repair-or-replace warranty

To learn more about power line disturbances, our line of plug-in power protection, and where to obtain your Surge Sentry, call toll-free (800) 892-1342. In California, (408) 438-5760.



INDUSTRIES

RKS Industries, Inc. 4865 Scotts Valley Drive Scotts Valley, CA 95066

## FEBRUARY SPECIALS

| DeseRupember D.M. Mainframe, 19 clots       |        |
|---------------------------------------------|--------|
| ParaDynamics R.M. Mainframe, 18 slots       |        |
| w/C.V.T. p/s & state of the art cooling     | 637.00 |
| CROMEMCO, 16 FDC D.D. Disk Controller Board | 506.00 |
| MORROW DESIGNS, WB-800 8 Slot Motherboard   | 75.00  |
| VOTRAX, Type-n-Talk, compatible w/most      |        |
| computers                                   | 219.00 |
| TECMAR'S Shared Device (4) Controller for   | 213.00 |
| IBM PC                                      | 210.00 |
|                                             | 319.00 |
| CCS, 64K Dynamic RAM Board                  | 319.00 |
| GODBOUT/COMPUPRO, RAM 16, static 64K        |        |
| board                                       | 489.00 |
| ADDS Viewpoint, green screen terminal       |        |
| w/detached k.b.                             | 495.00 |
| AMDEK, Color II, Hi-RES, RGB, 13" monitor   | 695.00 |
| E.C.T. RM-10 slot MB w/15AMP p/s            | 225.00 |
| EPSON MX100 III                             |        |
|                                             | 595.00 |
| SCION'S MicroAngelo, Multi-Trans. Color     |        |
| graphics                                    | Call   |
| TELEVIDEO Terminal, TVI 950                 | 895.00 |
| HOURS 9:00 AM — 6:00 PM M-F                 |        |

Subject to Available Quantities • Prices Quoted Include Cash Discounts. Shipping & Insurance Extra.

We carry products from all Major Manufacturers



## PROM ERASER

- Flement life 7700 hours
- Frases all UV FPROMS (2716, 2732, 2516, 2532, etc.)



\$97.50 INTELLIGENT PROGRAMMER STAND ALONE

\* HOBBY MODEL

INDUSTRIAL MODEL

QUV-T8 / 2N

\$68.95

WITH TIMER AND

**SAFETY SWITCH** 

QUV-T8 / 2T

**RS-232** RELIABLE EASY COPY (No external

(MCS-48)

PROGRAMMING

\* USER FRIENDLY PROGRAMS: 2508, 2516, 2532, 2716, 27C16, 27C32, COMPATIBLE: IBM PC, TRS-80, APPLE, CPM, FLEX, TEKTRONICS, MOS

- 2732A, 2758, 8748, 8749H, 8748H OPTIONAL MODULES: 2564, 2764, 8755A, 8741
  - \* STANO ALONE, CRT, OR COMPUTER CONTROL

    \* UPLOAC/DOWNLOAO IN MOTOROLA OR INTEL HEX FORMAT

    \* MICROPROCESSOR BASED \* 4 K INTERNAL RAM

    \* 90 DAY PRATS & LABOR WARRANTY ON ALL PRODUCTS

SOON TO BE RELEASED:

PROMPRO-8 128K Version \$689. MONEY BACK GUARANTEE

## PRICEINCLUDES PERSONALITY MODULE \$489.00

LOGICAL DEVICES INC. 781 W. OAKLAND PARK BLVD. • FT. LAUDERDALE, FL 33311

Phone Orders (305) 974-0967 • TWX: 510-955-9496 SEE US AT COMDEX SPRING - BOOTH #3019

## Event Queue -

eral and concurrent sessions will focus on electronic payment systems and services. Topics to be covered include automated teller machines. home information and financial services, legal issues, and technical standards. Further information is available from the EFT Association. Suite 800, 1029 Vermont Ave. NW, Washington, DC 20005, (202) 783-3555.

April 10-13

APL83. Sheraton Washington Hotel, Washington, DC. This conference and exhibition includes hands-on displays and presentations of technical papers. For particulars, contact D & S Whyte Associates, Conference and Exhibits Manager, Suite 200, 117 King St., Alexandria, VA 22314, (703) 548-2802.

April 11-15

Intergraphics '83, Takanawa Prince Convention Center. Tokyo, Japan. This conference and exhibition will cover a wide range of computergraphics topics, including business and management graphics, virtual machine languages, and chemical and biochemical applications of computer graphics. Complementing formal programs will be speakers, discussions, and tutorials. For complete details, contact the World Computer Graphics Association, Suite 250, 2033 M St. NW, Washington, DC 20036, (202) 775-9556.

April 12-13

Selecting a Microcomputer for Scientific and Engineering Applications, Golden, CO. For details, see March 15-16.

April 12-15

Computer Network Design and Protocols. Boston, MA. For details, see March 1-4.

April 13-20

Hanover Fair '83-Cebit '83. Hanover, West Germany. The Hanover Fair is one of the world's largest industrial trade fairs. Attention will be paid to office equipment and dataprocessing technology. More than 1200 exhibitors from 30 countries will display their products to a crowd of more than 230,000. Full information is available from the Hanover Fairs Information Center. Salem Industrial Park, POB 338, Whitehouse, NJ 08888, (800) 526-5978; in New Jersey, (201) 534-9044.

April 15-17

The Use of Computers in Psychology, Hilton, Wilmington, NC. With a focus on microcomputers, the five planned symposia will explore such issues as statistical and therapeutic applications and the use and misuse of microcomputers in psychological assessment. For complete details, write to Steven R. Edelman, Association of Eastern North Carolina Psychologists, 105 Lou Dr., Goldsboro, NC 27530.

April 19-21

Electro/83—High-Technology Electronics Exhibition and Convention, Coliseum and Sheraton Centre. New York. NY. For information, contact Electronic Conventions Inc., 999 North Sepulveda Blvd., El Segundo, CA 90245, (800) 421-6816; in California, (213) 772-2965.**■** 

In order to gain optimal coverage of your organization's computer conferences, seminars, workshops, courses, etc, notice should reach our office at least three months in advance of the date of the event. Entries should be sent to: Event Queue, BYTE Publications, POB 372, Hancock NH 03449. Each month we publish the current contents of the queue for the month of the cover date and the two following calendar months. Thus a given event may appear as many as three times in this section if it is sent to us far enough in advance.

## **Books Received**

The Art of Programming the 1K ZX81, M. James and S. M. Gee. London, England: Bernard Babani Publishing Ltd. (The Grampians, Shepherds Bush Rd.), 1982; 86 pages, 11.1 by 17.6 cm, softcover. ISBN 0-85934-084-8. £1 05

Assembly Language Programming for the Apple II, Robert Mottola. Berkeley, CA: Osborne/McGraw-Hill, 1982; 143 pages, 16.4 by 23.3 cm, softcover, ISBN 0-931988-51-9, \$12.95.

BASIC Exercises for the Apple, J. P. Lamoitier. Berkeley, CA: Sybex, 1982; 258 pages, 17.7 by 22.8 cm, softcover, ISBN 0-89588-084-9, \$12.95.

The Cosmic Mind-Boggling Book, Neil McAleer. New York: Warner Books, 1982; 207 pages, 13.3 by 20.2 cm. softcover, ISBN 0-446-97663-6, \$7.95.

Discover FORTH, Learning and Programming the FORTH Language, Thom Hogan. Berkeley, CA: Osborne/ McGraw-Hill, 1982; 142 pages, 16.5 by 23.4 cm, softcover, ISBN 0-931988-79-9, \$14.95.

Fun with Microcomputers and BASIC, Donald D. Spencer. Reston, VA: Reston Publishing Co., 1981; 128 pages, 21.2 by 27.8 cm, softcover, ISBN 0-8359-2214-6, \$9.95.

A Guide to Software in Applesoft, Bruce Presley. New York: Lawrenceville Press, 1982; 181 pages, 21.5 by 27.8 cm, softcover, ISBN 0-442-25890-9, \$12.95.

Inside Atari DOS, Bill Wilkinson, Greensboro, NC: Computel Books, 1982; 120 pages, 15.5 by 22.4 cm, spiral binder, ISBN 0-942386-02-7, \$19.95.

Interface Projects for the Apple II, Richard C. Hallgren. Englewood Cliffs, NJ: Prentice-Hall, 1982; 170 pages, 17.4 by 23.4 cm, softcover, ISBN 0-13-469387-6, \$12.95.

An Introduction to Programming and Problem Solving with Pascal, 2nd edition, G. Michael Schneider, Steven W. Weingart, and David M. Perlman. New York: John Wiley & Sons, 1982; 468 pages, 16.4 by 23.3 cm, hardcover. ISBN 0-471-08216-3. \$21.95.

Introduction to UCSD p-System, Charles W. Grant and Ion Butah, Berkeley, CA: Sybex, 1982; 370 pages, 17.7 by 22.8 cm, softcover, ISBN 0-89588-061-X, \$14.95.

Microcomputers in Amateur Radio, Joe Kasser. Blue Ridge Summit, PA: Tab Books, 1981; 307 pages, 12.7 by 20.8 cm, softcover, ISBN 0-8306-1305-6, \$9.95.

Microcomputers, What They Are and How to Put Them to Productive Use! A. J. Dirksen. Blue Ridge Summit, PA: Tab Books, 1982; 231 pages, 19.5 by 23 cm, softcover, ISBN 0-8306-1406-0, \$11.95.

Microprocessor Systems, Interfacing, and Applications, Robert J. Bibbero and David M. Stern. New York: John Wiley & Sons, 1982; 195 pages, 16.4 by 23.4 cm, hardcover, ISBN 0-471-05306-6, \$20.

Pocket Guide to BASIC. Roger Hunt. Reading, MA: Addison-Wesley, 1982; 64 pages, 4 by 6.3 cm, softcover, ISBN 0-201-07744-2, \$6.95.

Pocket Guide to COBOL, Ray Welland. Reading, MA: Addison-Wesley, 1982; 96 pages, 4 by 6.3 cm, softcover, ISBN 0-201-07750-7, \$6.95.

Pocket Guide to FOR-TRAN, Philip Ridler, Reading, MA: Addison-Wesley, 1982; 64 pages, 4 by 6.3 cm, softcover, ISBN 0-201-07746-9, \$6.95.

Pocket Guide to Pascal, David Watt. Reading, MA: Addison-Wesley, 1982; 64 pages, 4 by 6.3 cm, softcover, ISBN 0-201-07748-5, \$6.95.

Pocket Guide to Programming, John Shelley. Reading, MA: Addison-Wesley, 1982: 64 pages, 4 by 6.3 cm, softcover, ISBN 0-201-07736-1, \$6.95.

Practical Guide to Computers in Education, Peter Coburn, Peter Kelman, Nancy Roberts, Thomas F. F. Snyder, Daniel H. Watt, and Chervl Weiner. Reading, MA: Addison-Wesley, 1982; 266 pages, 16.4 by 23.4 cm, softcover, ISBN 0-201-10563-2, \$9.95.

Practical Pascal Programs, Greg Davidson. Berkeley, CA: Osborne/McGraw-Hill, 1982; 205 pages, 21.1 by 27.5 cm, softcover, ISBN 0-931988-74-8. \$15.99.

Problem Solving and Computer Programming, Peter Grogono and Sharon H. Nelson, Reading, MA: Addison-Wesley, 1982; 284 pages, 16.4 by 23.4 cm, softcover, ISBN 0-201-02460-8, \$14.95.

Programming Microcomputers with Pascal, M. D. Beer, New York: Van Nostrand Reinhold, 1982; 256 pages, 15.3 by 23.4 cm, softcover, ISBN 0-442-2136-9, \$13.95.

Solid-State High-Frequency Power, Irving M. Gottlieb. Reston, VA: Reston Publishing Co., 1982; 246 pages, 16.4 by 23.3 cm, hardcover, ISBN 0-8359-7048-5, \$21.95.

Structured Programming with COMAL, Roy Atherton. New York: Halsted Press, 1982; 266 pages, 16.4 by 23.4 cm, hardcover, ISBN 0-470-27318-6, \$49.95.

The Z8000 Microprocessor, A Design Handbook, Bradly K. Fawcett. Englewood Cliffs, NJ: Prentice-Hall, 1982; 310 pages, 17.4 by 23.2 cm, softcover, ISBN 0-13-983734-5, \$16.95. ■

This is a list of books received at BYTE Publications during this past month. Although the list is not meant to be exhaustive, its purpose is to acquaint BYTE readers with recently published titles in computer science and related fields. We regret that we cannot review or comment on all the books we receive; instead, this list is meant to be a monthly acknowledgment of these books and the publishers who sent them.

## **BYTE's Bits**

## **CP/M Bulletin Board Up In Los Angeles**

Softwaire Centre International has a remote CP/M and bulletin-board system up and running in Los Angeles. Callers can send, receive, and read messages, and the system accepts data rates of 110, 300, 450, 600, and 710 bits per second. The system features an extensive catalog of the latest Apple, Atari, CP/M, IBM Personal Computer, and TRS-80 software titles. It's open 24 hours a day, and you're invited to leave messages and new ideas for the community.

Soon, volumes of CP/M Users Group (CPMUG) public-domain software will be available for downloading. The firm also plans to offer an array of source programs targeted at Apple, Atari, and TRS-80 users.

Contact The Softwaire Centre, 11768 West Pico Blvd., West Los Angeles, CA 90064, (213) 473-1136, or leave a message for the system operator, "SYSOP," on the bulletin board, (213) 479-3189.■

## **Ask BYTE**

## Conducted by Steve Clarcia

## CP/M for **Homebrewed Systems**

Dear Steve.

I have been bitten by the homebrew bug. I have a tentative design for a Z80-based computer with 64K bytes of memory and a memorymapped video display that I plan to build with a Standard Microsystems Corporation CRT-5037. The system will use a Western Digital Corporation FD-1771 floppy-disk controller and whatever ROM (read-only memory) I may need. I'm fairly confident of my hardware and programming abilities, up to and including writing an operatingsystem monitor.

What would it take to run

the CP/M disk operating system? Is it generalized enough to be flexible: is a source listing available so that I can change the software to suit my system? How does CP/M talk to its host system? Is it merely designed for serial video? Can system ROM exist anywhere in memory? Does Digital Research even release this sort of information to Joe-Average hobbvist?

I know that tackling this will not be a piece of cake, but I'm a technician and do this sort of stuff for a living. In fact, I enjoy it—save for occasional head-to-wall bangings. Phil Rorex

Long Beach, CA

CP/M (control program for

microcomputers) is made by Digital Research Corporation. In order to protect its product, no source code is available. The CP/M operating system is made up of the following main subsystems:

FDOS (functional disk operating system)—which is divided into (a) the BIOS (basic input/output system), which handles data transfers to and from peripherals, and (b) BDOS (basic disk operating system), which manages all disk files

CCP (console command processor)—which reads and processes your commands

TPA (transient program area)—a program storage and operating area

BOOT—a program that tells you where the CCP is located.

The BIOS is unique for each microcomputer. When you buy CP/M. you configure the BIOS so that it knows where your printer, terminal, and other devices are located. All other parts of CP/M are truly hardware-independent.

It takes a minimum of 16K bytes to run CP/M, and system ROM can be placed in the TPA. A bootstrap ROM is usually located at hexadecimal 0000 to read in the CP/M system. Digital Research has extensive documentation concerning the loading and implementation of CP/M. For further information, contact Digital Research Corp., POB 579. Pacific Grove. CA 93950. (408) 649-3896. . . . Steve

## Remote IBM **Keyboard Operation**

Dear Steve.

I'd like to use my IBM Personal Computer's keyboard some 75 feet away from the main machine. Do you know a simple driver circuit using buffers and Schmitt triggers that will let me do this?

## Buryl B. Noah Hartsdale, NY

I addressed this problem several years ago in an article

titled "Come Upstairs and Be Respectable" (May 1977 BYTE, page 50; also available in Ciarcia's Circuit Cellar, volume 1, from BYTE/Mc-Graw-Hill, Princeton Rd., Hightstown, NJ 08520, (609) 426-5254). The parallel output of the keyboard is converted to serial data by a UART (universal asynchronous receiver/transmitter), then transmitted over a long twisted pair. Because the output of the IBM's keyboard is

serial, all you need to do is build the part of the circuit that buffers and detects the signals (figure 1).

The preferred method for transmitting data over long distances is to use a balanced line. In my article, I used National Semiconductor's 5-volt differential line driver, DS8830, and a line receiver. DS8820. Texas Instruments makes equivalent devices called the SW75182 and the SW75183. . . . Steve

## **Doubling Expansion Interface Memory**

Dear Steve.

The Expansion Interface for the Radio Shack TRS-80 Model I has only 16K bytes of memory. I would like to upgrade that to 32K bytes. How do I go about it? I see that there are eight unused sockets inside the interface. Can I plug in eight more 4116-200ns dynamic-memories, or is there more to it than that?

Michael Mevers San Bernardino, CA

Expanding the Radio Shack Expansion Interface from 16K bytes to 32K is simply a matter of plugging eight additional memories (type 4116-200ns) into the eight empty sockets you mentioned. The only precautions are to be sure that the circuits are oriented properly and you must avoid any static damage

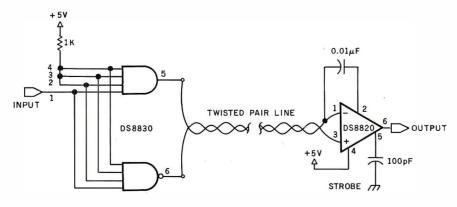


Figure 1

by touching a ground connection before handling the devices. Naturally, all power must be off before inserting or removing any ICs from a computer or expansion interface. . . . Steve

## Speaking of Speech Recognition

Dear Steve.

As a long-time subscriber to BYTE, I have enjoyed your many articles. In particular, I was quite impressed by your article entitled "Use of Voiceprints to Analyze Speech," which appeared in the March 1982 BYTE (page 50).

In that article, you made reference to speech-recognition systems, both for professional computing systems and personal computers. You also mentioned that budget-priced speech-recognition systems, costing in the neighborhood of \$500, are available. Do you know where I could get more information about such systems? Could you give me the names and addresses of one or more companies that market speech-recognition systems for personal computers? Are any systems available for S-100 bus computers?

## R. L. Froemke Tallahassee, FL

The field of speech recognition is emerging from science fiction into reality. Many companies are making products for both the hobbyist and the industrial computer markets. Here's a list of several companies marketing speech-recognition systems. . . . Steve

Centigram Corp. Suite 108 155A Moffett Dr. Park Sunnyvale, CA 94086

Interstate Electronics 707 East Vermont St. Anaheim, CA 92803 Perception Technology Inc. 95 Cross St. Winchester, MA 01890

Scope Electronics Inc. 1860 Michael Faraday Dr. Reston. VA 22090

Scott Instruments
Suite 5
815 North Elm Street
Denton, TX 76201

Threshold Technology 1829 Underwood Blvd. Delran, NJ 08075

Verbex Corp. 2 Oak Park Bedford, MA 01730

Voicetek POB 388 Goleta, CA 93017 mats are not similar, it is impossible for one computer to read another computer's disk.

The fact that the disks run at the same speed is of no relevance because the number of sectors is not the same, the directories are stored on different tracks, and the data formats are not alike. Your method of using an RS-232C interface and a modem to transfer between computers works fine. But it's terribly slow if data is transferred at

300 bps (bits per second). If both computers are in the same room, the serial ports can be directly connected and data transferred at rates of up to 19,200 bps.

One of the strong points of the CP/M operating system (distributed by Digital Research) is that its disk formats are identical for different computers. Therefore, the disks are portable and can be saved on one computer and loaded on another. . . . Steve

In "Ask BYTE," Steve Ciarcia answers questions on any area of microcomputing. The most representative questions received each month will be answered and published. Do you have a nagging problem? Send your inquiry to:

oblem? Send your inquiry to Ask BYTE clo Steve Ciarcia

POB 582 Glastonbury CT 06033

If you are a subscriber to The Source, chat with Steve (TCE317) directly. Due to the high volume of inquiries, personal replies cannot be given. Be sure to include "Ask BYTE" in the address.

## Interchanges Slow, If Possible

Dear Steve,

I have a Radio Shack TRS-80 Model III at home and an Apple II Plus at work. Both machines have two 51/4-inch disk drives. I would like to write ASCII files and BASIC programs to disk with either machine and be able to read them with both.

Currently, I must transfer files through RS-232C serial interfacing, modems, and over telephone lines. The disk drives for both computers run at 300 rpm (revolutions per minute), so is it possible, with software only, to read files with the TRS-80 from a disk written by the Apple and vice versa?

Finis E. Gentry Prospect, KY

Your question about interchanging disks between Radio Shack and Apple computers points up a major problem in the personal computer industry: because the disk forNEW



MMEDIATIVERY

INCOMM AUTO DIAL 300/1200 (212A) MODEM FOR \$599.00 INTRODUCTORY GET ACQUAINTED PRICE!

(For A Limited Time Only!)
FOR A AUTOMATIC DIALING
300/1200 BAUD MODEM \$495.00
(Limit Two Per Customer) \*Compatible with Hayes

YOU DO NOT NEED A TELEPHONE
"To originate or to receive a call" Simply
hook up the modularjack(RJ11C) directly to
the phone line, then type the phone number
in your terminal or Microcomputer and the
INCOMM Auto Dial 212A Modem will automatically dial the number and make the
connection. It will then remember the number
and will redial by a simple command. The
reliability of all INCOMM products is so high
that we back our products with a full TWO
YEAR WARRANTY!

**DEALER INQUIRIES INVITED!**(Some selected territories are still available)

CALL COLLECT TO ORDER DESK ONLY (312)459-8874 (Bank Cards accepted).

INCOMM

115 N. Wolf Road Wheeling, IL 60090 (312)459-8881

## **Clubs and Newsletters**

## By Word of Mouth

W.P. News: Writer's POV on Word Processing is a newsletter for wordsmiths who work with computers. It is published bimonthly by Word of Mouth Enterprises. The newsletter includes evaluations of hardware and software for writing needs, interviews with authors, and upto-date developments for writers. The annual subscription fee is \$20. For more information, write to Word of Mouth Enterprises, 1765 North Highland #306, Hollywood, CA 90028.

#### **Attention: Dentists**

Dentists in Detroit have formed a users group for those who have purchased the Dental Practice package from Moore Business Systems Inc. The group's members discuss various hardware and software products, assist members with specific computer problems, and plan to develop a library of self-help materials. For more information, forward a self-addressed envelope to W.A. Riggert, D.D.S., Parkwood Dental Group, 10831 West Ten Mile Rd., Oak Park, MI 48237.

## Experimenters In Canada

Ipso Facto is a publication of the Association of the Computer-Chip Experimenters, a nonprofit, educational organization based in Ontario, Canada. Meetings are held on the second Tuesday of each month, September through June, at 7:30 p.m. in room B123, Sheridan College, 1430 Trafalgar Rd., Oakville, Ontario. Membership dues are \$18 and entitle you to six issues of Ipso Facto. For fur-

ther information, write to Mike Franklin, Association of Computer-Chip Experimenters, 650 Laurier Ave., Milton, Ontario L7T 4R5, Canada, or call (416) 878-0740.

## Foghorn from FOG

The First Osborne Group (FOG) is for Osborne users and other computer owners. The group plans to present reviews of new software and hardware in its newsletter, Foghorn, and through local meetings. Vendors or interested individuals can contact Craig R. Chun, Apt. 225, 1607 Parkmoor Ave., San Jose, CA 95125, or call (408) 947-1650.

#### OSBUG In Canada

An Osborne 1 Users Group (OSBUG-Canada) meets on the third Monday of each month in the Vancouver area. OSBUG-Canada works with both FOG and the Northwest Osborne Users Club. Further information can be obtained by contacting Debra Danny, 15227 Russell Ave., White Rock, British Columbia, V4B 5C3 Canada, or by phoning (604) 536-0266.

## TRS-80 Users In Chicago

The Chicago TRS-80 Users Group publishes a monthly newsletter. *Chicatrug News* prints "All the TRS-80 News You Need When You Need It." Single issues are \$1.50; subscriptions cost \$12 for one year in the U.S., \$16 in Canada and Mexico, and \$26 elsewhere. Press releases and articles are welcome. For further information, contact Emmanuel B. Garcia Jr. & Associates, Suite 2118, 203

North Wabash, Chicago, IL 60601, or call (312) 782-9750.

## Audio-Visual News Updated

Navanews is the biweekly bulletin of the National Audio-Visual Association (NAVA), an international trade association of audio-visual/video dealers, manufacturers, and producers. Subscriptions are \$50 per year. For information, write to NAVA, 3150 Spring St., Fairfax, VA 22031, or call (703) 273-7200.

## **Southern Hobbyists**

The CSRA Computer Club is an active group of computer hobbyists and professionals that has been producing a monthly newsletter for six years. Dues are \$12 a year; students are half price. Anyone interested may attend meetings which are held on the third Thursday of each month at 7:30 p.m. For more information, write to the CSRA Computer Club, POB 284, Augusta, GA 30903.

### Tips for the Salesman

Master Salesmanship is a newsletter that focuses on effective techniques for selling data-processing products and services. For a free copy of Master Salesmanship, call Michael Lodato at (213) 889-2607, or write to M.W.L. Inc., 32038 Watergate Court, Westlake Village, CA 91361.

## Attention: Homebrewers

The Homebrew Computer Club Newsletter will keep you

posted on this San Francisco Bay area club's monthly meeting dates and locations. To subscribe, write to the Homebrew Computer Club Newsletter, POB 626, Mountain View, CA 94042.

## **Newsletter Offer**

The Small Business Systems Group publishes a newsletter that is available free for six months from the date of your return of the Product License Agreement proving purchase of at least \$150 of hardware or software sold through SBSG. For details, write to the Small Business Systems Group, Newsletter Subscription, 6 Carlisle Rd., Westford, MA 01886, or call (617) 692-3800.

## Phoenix Valley Idea Exchange

The Phoenix Valley of the Sun IBM PC Idea Exchange is held once a month for anyone interested in using and programming the IBM Personal Computer. It is sponsored by the United Systems Corporations of Phoenix, Arizona. For meeting information, write to the IBM PC Idea Exchange, c/o United Systems Corporations, 1074 East Sandpiper Dr., Tempe, AZ 85283, or call (602) 831-9363.

## SVC<sup>3</sup> Presents: A New Club

The Silicon Valley Color Computer Club is for TRS-80 Color Computer owners. It meets on the fourth Tuesday of each month at 7:30 p.m. in the GTE-Sylvania Cafeteria, Building #3, 100 Ferguson Dr., Mountain View, California. For more information, call

(408) 749-1947, or write to the Silicon Valley Color Computer Club, POB 61593, Sunnyvale, CA 94088.

## **Support for Home** Computer Users

The International Home Computer Users Association is an independent, nonprofit organization formed as a support group for home computer owners. It provides members with an information and referral service, a biweekly bulletin, consumer aid, and a monthly newsletter. The group has published information on how to start a users group in your area. For more information, write to ICA, POB 371, Rancho Santa Fe, CA 92067.

## **Apfelsaft Comes** from West Germany

The Apfelsaft newsletter is available to Apple and Basis Computer users anywhere in the world. It is produced for English-speaking people living overseas. Apfelsaft (applejuice) is supported by the Ramstein Computer Club, which meets monthly. For further information, write to Apfelsaft, Wade Arnold, Ben-37, D-6750 zinoring Kaiserslautern, West Germany, or call (0631) 93396.

### **SUN In Illinois**

The Sinclair Users Network (SUN) is a nationwide users group for owners of Sinclair ZX80/81 and Timex/Sinclair 1000 computers. It produces monthly bulletins and quarterly newsletters containing the latest information from Sinclair, Timex, and other manufacturers. For further information, write to Diana Wright, 2170 Oak Brook Circle, Palatine, IL 60067, or call (312) 934-9375.

### Information from Waterloo

Infowat is the newsletter produced by Watsoft Products Inc., a company established by the University of Waterloo in Ontario. The newsletter has reviews of educational software developed by the university. A subscription (10 issues) costs \$10 (Canadian funds in Canada, U.S. dollars elsewhere). To receive information, write to Infowat, POB 943, Waterloo, Ontario N2J 4C3, Canada. ■

If you would like BYTE readers to know about your club ornewsletter send the details accompanied by no more than one newsletter to Clubs and Newsletters, BYTE Publications, POB 372, Hancock, NH 03449. Overseas groups are encouraged to participate. Please allow at least three months for your announcement to appear.

## **Not Just** Another Summer Camp.



## Learning is part of the fun at ATARI® Computer Camps.

- Coed, ages 10-16
- With or without computer skills
- 2, 4, or 8 week sessions Traditional camp activities
- Convenient locations
   Professional Camp Directors

CALL FREE 800/847-4180



For more information and a free, color brochure, call free 800/847-4180 or write to 40 East 34th Street, Dept. CT, New York, N.Y. 10016 (please include age and phone number). Outside U.S. or in New York State, call collect 212/889-5200. Staff applicants should apply in writing.

MA Warner Communications Company



C. ITOH F-10 PRINTER 40 CPS daisywheel printer. Para-Ilel. Limited time offer. . \$ Call COMREX CR-1-C Daisywheel, 17 CPS Parallel . . . . . . . . \$769.00 COMREX CR-1-S As above but serial w/tractor . . . . \$789.00



BROTHER PRINTER HR-1 tter quality daisywheel printer, CPS, friction feed, Parallel in-face. Super value \$759.00 terface. Super value NEC SPINWRITER 3550 Serial interface. Ideal for PC .\$2,099.00



Two disk drives, CPU, Terminal and FREE software. Special . . \$1,995



TELEVIDEO TERMINALS 



MONITOR SALE MOWITOH SALE
Dynax GM-120, Green . . . \$139
Dynax AM-121, Amber . . . \$159
Taxan KG12N, Green . . . \$145
Taxan KG12N, Green . . \$145
NEC JC1203 RGB for IBMPC \$749 NEC JCT203 HGB for IBMPC \$749
Cable—NEC to IBM . . . . \$19
Princeton HX-12 RGB for IBM \$675
Taxan RGBvison I, 380 dot . \$365
Taxan RGBvision II, 510 dot . \$549
Taxan RGBvision III, 630 dot . \$640
Cable—Taxan to IBM or Apple . \$19

IBM Personal Computer Call for prices and availability AST MEMORY CARDS ComboPlus, MegaPlus and I/O Plus cards for IBM PC. Call for best price 51/4 TANDON DRIVES The newest. IBM PC compatible Installation instruction included

IRM

Kaise

Calif., Alaska, Hawai (213)725-3080



To order, please send money order or cashier's check. Personal or company checks require 2-3 weeks to clear Prices reflect 3% cash discount. Visa/Mastercard accepted. Shipping, insurance & handling charges: 3% of tota order value by UPS Surface, 5% by UPS Air or Parcel Post. California residents add sales tax. COD's require 20% deposits. Prices & availability subject to change without notice. Send for Monthly Specials and Catalog

EASTERN ENTERPRISES, INC. 2937 S. VAIL AVE., LOS ANGELES, CALIF. 90040

TOLL-FREE (800)392-7081

VISA

## **Software Received**

Apple

The Apple's Core, a tutorial program. The disks and manual comprising this package serve as a beginner's guide to Applesoft BASIC. Each lesson in the manual corresponds to a program on the disk. For the Apple II Plus; floppy disk, \$49.95. The Little Professor, POB 301. Swanton. VT 05488.

The Arithmetic Classroom, part of a set of tutorial programs. The programs in this package cover the basic principles of mathematics. Each program covers a different aspect of math. For the Apple II Plus; floppy disk, \$49.95. Sterling Swift Publishing Co., 1600 Fortview Rd., Austin, TX 78704.

Artesians, an arcade-type game. You must steal several containers of water from a four-story building while sneaking through the floors and avoiding the guards, dogs, and the artesians. For the Apple II; floppy disk, \$34.95. Rennaisance Technology Corp., 1070 Shary Circle, Concord, CA 94518.

Beneath Apple Manor, an adventure-type game. This remake of the original game includes high-resolution graphics and sound. Your mission is to explore an underground maze and find treasures. For the Apple II; floppy disk, \$29.95. Quality Software, Suite 105, 6660 Reseda Blvd., Reseda, CA 91335.

The Blade of Blackpoole, an adventure-type game with graphics. Your quest is for the magical sword Myraglym. You must fight off beasts and flesh-eating plants as you search the caverns near the blackpoole. For the Apple II; floppy disk, \$39.95. Sirius Software Inc., 10364 Rockingham Dr., Sacramento, CA 95827.

Bug Battle, an arcade-type game. Bugs have invaded

your garden and your laser is the only defense you have against them. Game features include graphics and sound. For the Apple II Plus and Apple III: floppy disk. \$22.50. United Software of America, 750 Third Ave., New York, NY 10017.

Bug Byter, a screen-oriented 6502 machine-language debugger. This debugger features a display of all registers. literal and transparent breakpoints, and a resident assembler and disassembler. For the Apple II; floppy disk, \$47.50. Computer Advanced Ideas Inc., Suite 341, 1442A Walnut St., Berkeley, CA 94709.

Bulk Mailer, a mailing-list program. This system is configured for either a floppydisk or a hard-disk system. It can store 1200 names on a floppy disk or 32,000 names on a hard disk. Names can be coded and retrieved. For the Apple II; floppy-disk version, \$125; Corvus hard-disk version, \$250. Satori Software, 5507 Woodlawn Ave. N, Seattle, WA 98103.

Career Directions, a program to help high school students identify career interests. By completing a series of exercises, students can determine the type of career they prefer. For the Apple II; floppy disk, \$59.95. Systems Design Associates Inc., 723 Kanawha Blvd. E, Charleston, WV 25031.

Caves of Olympus, an adventure-type game. You are far beneath the Palace of Anson Argyris. You must try to escape the attack of the Laren invaders by traversing the caves of Olympus. For the Apple II Plus; floppy disk, \$39.95. Howard W. Sams & Co. Inc., 4300 62nd St., POB 558, Indianapolis, IN 46268.

Counting Plus, an educational program designed to introduce very young children to the principles of numbers. It covers simple counting, addition, and subtraction. For the Apple II; floppy disk, \$34.95. The Little Professor (see address above).

Desktop/Plan II. a financial planning, budgeting, and analysis package with graphics. This program lets you build modifiable financial models. It can make use of Visicalc data files. For the Apple II; floppy disk, \$250. Visicorp, 2895 Zanker Rd., San Jose, CA 95134.

Diamond IX, a baseball statistics package. A coach can keep individual and team statistics to see his team's strong and weak points. Reports can be displayed or sent to a printer. For the Apple II; floppy disk, \$41.95. Competitive Computing Inc., 15 Sequoia Dr., Watchung, NJ 07060.

Disk O' Utilities, a package containing 13 utility programs, including automatic line numbering for Applesoft programs, a program to recover files, a catalog sorter, and a routine to indicate the number of free sectors on a disk. For the Apple II Plus; floppy disk, \$13.95. Broadway Software, Suite 136, 642 Amsterdam Ave., New York, NY 10012.

Diversi-DOS, a utility program that's compatible with Apple DOS 3.3. This program loads and saves BASIC, binary, and text files two to five times faster than DOS 3.3. A keyboard and print buffer are provided. For the Apple II; floppy disk, \$30. Diversified Software Research Inc., 5848 Crampton Court, Rockford, IL 61111.

The DOS Enhancer, a set of utility programs to speed up Apple DOS 3.3. These programs increase the speed of disk-file saves and reads. Additionally, the programs have expanded menus and are said to run BASIC programs five times faster than DOS 3.3. For the Apple II; floppy disk, \$69.95. S & H Software, 58 Van Orden Rd., Harrington Park, NJ 07640.

DOS Helper, a utility program that lets you change DOS commands, modify error messages, alphabetize catalogs, expand catalog displays, restore deleted files. lock or unlock files, and more. For the Apple II; floppy disk, \$29.95. The Little Professor (see address ahove)

Ernie's Quiz, a set of four educational games for children aged 4 to 7. This package includes guessing and counting games, a make-aface puzzle, and a puzzle using Sesame Street Muppet characters. For the Apple II; floppy disk, \$50. Apple Computer Inc., 20525 Mariani Ave., Cupertino, CA 95014.

Family Pak 1, a trio of games for the entire family: Hi-Lo, Hangman, and Go Fish. For the Apple II; floppy disk, \$29.95. Cortland Data Systems, POB 14414, Chicago, IL 60614.

Fore, a golf simulation game featuring high-resolution graphics. This game offers a choice of two courses, eight types of terrain, and 15 clubs. For one to four players. For the Apple II; floppy disk, \$29.95. Epyx/Automated Simulations Inc., 1043 Keil Court, Sunnyvale, CA 94086.

Games for the Apple Computer, a program disk of modules that lets you create games. This package complements Franklin, Knoltnow, and Finkel's book *Techniques* for Creating Golden Delicious Games for the Apple Computer. For the Apple II; floppy disk, \$47.90, including the book. John Wiley & Sons Inc., 605 Third Ave., New York, NY 10158.

Instant Mathematical Programming, a program package that solves a variety of mathematical problems. Designed for professionals or students, this program can, for example, handle simultaneous equations in algebraic form. For the Apple II; floppy disk, \$250. PCD Systems Inc., 163 Main St., POB 143, Penn Yan, NY 14527.

Instant Zoo, a set of five programs for children aged 7 to 10. This package has fast-moving games to help develop pattern-recognition and word skills. For the Apple II; floppy disk, \$50. Apple Computer Inc. (see address above).

League Registration, a filing system for sports league information. This system lets you organize, manage, and retrieve league and player information. A program disk can hold information on up to 500 players. For the Apple II Plus; floppy disk, \$150. Market Computing, 201 15th Ave. SW, Puyallup, WA 98371.

League Scheduling, a program that creates a round-robin schedule for one or more athletic leagues. It prepares a game schedule taking into account teams, times, days of the week, and holidays or rainouts. For the Apple II Plus; floppy disk, \$100. Market Computing (see address above).

League Standings, a program that registers game results and computes league and team standings for one or more leagues. This program records win/loss statistics, displays statistics on screen, and lets you edit statistics. For the Apple II Plus; floppy disk, \$100. Market Computing (see address above).

Long-Term Reservations, a time-scheduling program that handles reservations for sports facilities where long lead-times and variablelength time periods are desired. Completed schedules can be sent to a printer. For the Apple II Plus; floppy disk, \$100. Market Computing (see address above).

Mix and Match, a set of four educational games for children. This package includes a muppet match game, an animal word game, a puzzle, and a word game. An editor is provided for the word game. For the Apple II; floppy disk, \$50. Apple Computer Inc. (see address above).

Monster Mash, an arcadetype game. Your job is to prevent the monsters from leaving the graveyard and attacking the people in the city. All you have are your reflexes and the Monster Mash. For the Apple II and Apple III; floppy disk, \$29.95. The Software Farm, 3901 South Elkhart, Aurora, CO 80014.

PDQ 1.0, a database-management program featuring user-friendly prompts, simple commands, and fast retrieval. Its files can hold up to 28,000 characters. You can have as many as eight files on two drives. For the Apple II; floppy disk, \$59.95. Howard W. Sams & Co. Inc. (see address above).

The Programmable Cube, a program for solving the Rubik's Cube puzzle. Serving as an exercise in programming instruction, this package allows you to develop a cube-solving program. Video displays generated by this program are suitable for black-and-white or color monitors. For the Apple II; floppy disk, \$34.95. Metacomet Software, POB 31337, Hartford, CT 06103.

Quick-Search Librarian, a database-management program that cross-references literature citations. Technical references or journal articles can be cross-referenced with up to 12 keywords. One thousand articles or references can be stored on a single disk. For the Apple II

Plus; floppy disk, \$75. Interactive Microware Inc., POB 771, State College, PA 16801.

Rapid Reader, an educational program. This program helps to increase reading speed by progressively training you to rapidly recognize words and whole sentences. For the Apple II; floppy disk, \$39.95. Silicon Valley Systems, Suite 4, 1625 El Camino Real, Belmont, CA 94002.

Short-Term Reservations, a time-scheduling program that can make weekly lists of reservations for sports facilities and print out the schedule showing reserved times, facilities, and contact persons. For the Apple II Plus; floppy disk, \$100. Market Computing (see address above).

Spotlight, a set of four games for children aged 9 to 13. The games cover such advanced ideas as how light is reflected and elementary logic. For the Apple II; floppy disk, \$50. Apple Computer Inc. (see address above).

Swim Meet, a management program for scheduling swimming meets. This program registers contestants, records times, assigns lanes, and prints a list of final standings. For the Apple II Plus; floppy disk, \$125. Market Computing (see address above).

Tennis Draw, a tennis tournament-management program. This program registers and seeds players and teams for matches. It follows the U. S. Tennis Association rules. For the Apple II Plus; floppy disk, \$60. Market Computing (see address above).

Transylvania, an adventure-type game. The object of this game is to rescue a princess from the evil vampire. You must search a forest and a castle deep within Transylvania—avoid the werewolf.

For the Apple II; floppy disk, \$34.95. Penguin Software, 830 4th Ave., Geneva, IL 60134.

Visicalc Advanced Version, an electronic spreadsheet program. This version allows you to protect memory cell contents and hide sensitive information. It includes on-screen help displays. For the Apple III; floppy disk, \$400. Visicorp (see address above).

#### Atari

Alien Garden, an arcadetype game. You're an alien critter in a garden of crystal flowers. You must eat, bump, or sting as many flowers as you can before they destroy you. For the Atari 400/800; cartridge, \$39.95. Epyx/ Automated Simulations Inc., 1043 Kiel Court, Sunnyvale, CA 94086.

Armor Assault, a simulation game. You're the commander of NATO's armored forces. You must try to stop the enemy's armored columns from rolling across the North German plain. For one or two players. For the Atari 400/800; floppy disk, \$39.95. Epyx/Automated Simulations Inc. (see address above).

Bandits, an arcade-type game. You must guard the supplies on a lunar supply depot from the thieving aliens. You are armed with a mobile laser gun and protected by a limited shield. For the Atari 800; floppy disk, \$34.95. Sirius Software Inc., 10364 Rockingham Dr., Sacramento, CA 95827.

BASIC Routines, a set of program routines and instructions to help you learn how to program an Atari computer. This package features common subroutines for player graphics and disk utilities. For the Atari 400/800; floppy disk, \$24.95. Adventure International, POB 3435, Longwood, FL 32750.

Disk Workshop, a set of disk-utility programs that allows you to edit disks, copy disks rapidly, send a disk directory to a printer, and use machine-language strings in BASIC programs. For the Atari 400/800; floppy disk, \$39.95. Synergistic Software, Suite 201, 830 North Riverside Dr., Renton, WA 98055.

Diskey, a disk-utility program. With this program, you can examine and modify any sector on a disk, list unreadable sectors, send data in a sector to a printer, and copy a disk. Only one disk drive is required. For the Atari 400/800; floppy disk, \$49.95. Adventure International (see address above).

Gorf, a set of four arcadetype games: Astro Battles, Laser Attack, Space Warp, and Flag Ship. In all the games, you must destroy the attacking aliens to increase your score. For the Atari 400/800; floppy disk, \$39.95. Roklan Software, 10600 West Higgin Rd., Rosemont, IL 60018.

Labyrinths, a role-playing game. From a list of characters, you choose an identity to explore the labyrinth, find treasures, and fight monsters. For the Atari 400/800; floppy disk or cassette, \$28.95 and \$24.95, respectively. Progressive Computer Applications, POB 46, Burtonsville, MD 20866.

Paint, an educational program for children. This program lets your child draw color pictures on the screen, enlarge the picture, save it, and use different "brush" strokes and textures. For the Atari 400/800; floppy disk, \$39.95. Reston Publishing Co. Inc., 11480 Sunset Hills Rd., Reston, VA 22090.

Programmer's Workshop, a set of six utility programs. This package includes a disk-to-cassette transfer program, a compare utility for BASIC programs, and a cassette data-rate increase utility. For

the Atari 400/800; floppy disk, \$39.95. Synergistic Software (see address above).

Sneakers, an arcade-type game. Shoot the aliens before they destroy your ships. This game features five levels of skill and up to nine attacks per level. Points are scored for each alien shot. For the Atari 800; floppy disk, \$34.95. Sirius Software Inc. (see address above).

Wizard of Wor, an arcadetype game. As you progress through a series of mazes, you must destroy the wizard and the various creatures that aid him to score points and win the game. For the Atari 400/800; floppy disk, \$39.95. Roklan Software (see address above).

#### CP/M

Accounts Receivable, an accounts-receivable package. This menu-driven package features on-demand reports for customer lists and master, aged analysis, and control reports. For CP/M-based systems; floppy disk, \$1095. Cougar Mountain Software, 10 South Latah, POB 6886, Boise, ID 83707.

Data Champ, a database-management program. Designed for the first-time user, this package allows you to create a customized database. The manual includes a complete training program. For CP/M-based systems; floppy disk, \$395. Innovative Micro Systems, 12506 East 21st St., Tulsa, OK 74219.

Disk Fix, a disk editor and file-recovery utility program. You can examine, copy, and edit any disk sector. It lets you recover disk files, reconstruct damaged sectors, and use both hexadecimal and ASCII numbers. For CP/Mbased systems; floppy disk, \$150. The Software Store, 706 Chippewa Square, Marquette, MI 49855.

The Disk Inspector, a diskutility program that lets you examine any sector on any disk. Sectors from two different drives can be simultaneously displayed, copied, or modified. For CP/M-based systems; floppy disk, \$29.95. Realworld Software Inc., Suite 103, 913 South Fourth St., DeKalb, IL 60115.

Fancy Font System, a text-processing and print-formatting package designed for use with the Epson MX-80 printer. You can use a wide variety of letter fonts or create your own special font. For CP/M-based systems; floppy disk, \$180. Softcraft, Suite 1641, 8726 South Sepulveda Blvd., Los Angeles, CA 90045.

Menumaster, a system that allows you to develop custom menus for applications programs. The menus can provide user prompts, help and error messages, and error trapping. For CP/M-based systems; floppy disk, \$195. Borland International, 69 Upper Georges St., Dun Laoghaire, Dublin, Republic of Ireland.

S-BASIC, a structured BASIC translator and compiler. This version of BASIC features the ability to reference subroutines by name, indenting to display program structure, and other such functions. Program line numbers are not required. For HDOS- and CP/M-based systems; 5½-inch floppy disk, \$49.95. Sunflower Software, 13915 Midland Dr., Shawnee, KS 66216.

#### **IBM Personal Computer**

Aqua Run, an arcade-type game. You are a diver seeking treasure in an undersea maze. You must protect yourself from the undersea creatures by avoiding or spearing them. For the IBM Personal Computer; floppy disk, \$39.95. Soft Spot Micro Systems Inc., POB 415, North Canton, CT 06059.

Data Champ, a database-management program (see description under CP/M). For the IBM Personal Com-

puter; floppy disk, \$395. Innovative Micro Systems, 12506 East 21st St., Tulsa, OK 74219.

Executive Suite, a simulation game. In this game, you're an executive moving up the corporate ladder. You move through job interviews, middle management, and on into the executive suite. For the IBM Personal Computer; floppy disk, \$39.95. Armonk Corp., Suite 955, 610 Newport Center Dr., Newport Beach, CA 92660.

FORTH/level 2, an implementation of the FORTH language. This package features a multitasking real-time operating system with online documentation and support for the 8087 mathematics processor chip. For the IBM Personal Computer; floppy disk, \$300. FORTH Inc., 2309 Pacific Coast Highway, Hermosa Beach, CA 90254.

The Graphics Generator, a graphics generation program to create bar graphs, pie charts, and line or function graphs from mathematical data. You can superimpose graphs, send graphs to a printer, or save them on disk. For the IBM Personal Computer; floppy disk, \$195. Robert J. Brady Co., Bowie, MD 20715.

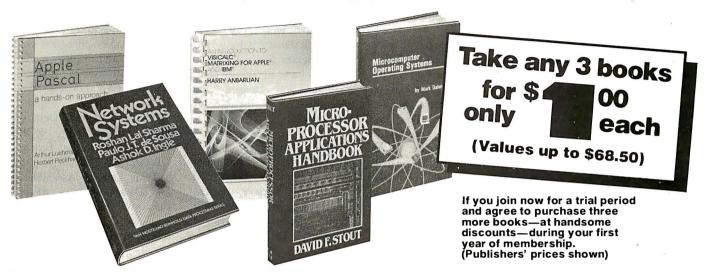
Graphmagic, a graphics generation program. You can draw visual representations of mathematical data in the form of bar and line graphs, pie charts, and scattergrams. For the IBM Personal Computer; floppy disk, \$89.95. International Software Marketing Ltd., Suite 421, 120 East Washington St., Syracuse, NY 13202.

Helpware, an interface program to IBM PC-DOS. This program simplifies using PC-DOS by providing a menu of file-manipulation commands. Files can be displayed, edited, and renamed with a single command. For the IBM Personal Computer; floppy disk, \$195. Soft-

# Introducing...the Byte Book Club

FORMERLY COMPUTER PROFESSIONALS' BOOK CLUB

# **POWERFUL TOOLS!** POWERFUL SAVINGS!



MICROPROCESSOR APPLI-CATIONS HANDBOOK By D. R.

617/988B \$35.00 (Counts as 2 of your 3 books)

NETWORK SYSTEMS By R. Sharma, P. J. T. deSousa, A. D. Ingle 58255**7-**0B \$29.95

(Counts as 2 of your 3 books) SOFTWARE ENGINEERING: A

Practitioner's Approach By R. S. Pressman 507/813B (Counts as 2 of your 3 books)

CIARCIA'S CIRCUIT CELLAR,

**Volume 2** By S. Ciarcia 109/63X \$14.75 **COMPILER CONSTRUCTION:** 

Theory and Practice By W. Barrett, and J. D. Couch 788/499B

(Counts as 2 of your 3 books)

AN INTRODUCTION TO VISI-CALC® MATRIXING FOR AP-PLE® AND IBM® By H. Anbarlian 016/054 \$22.95

BUILD YOUR OWN Z-80 COMPUTER—and—Z80 USERS MANUAL. By S. Ciarcia & J. Carr 582337-3B \$29.90 (Counts as 2 of your 3 books)

MICROCOMPUTER **OPERAT-**ING SYSTEMS By M. Dahmke 150/710 \$15.95

MINICOMPUTER AND MICRO-PROCESSOR INTERFACING By J. C. Clulev

582585-6B \$27.50 (Counts as 2 of your 3 books)

THE SOUL OF A NEW MA-CHINE By T. Kidder 582439-6 \$13.95

APPLE PASCAL By P. Luehrmann

**MICROCOMPUTER GRAPHICS** AND PROGRAMMING TECH-NIQUES By H. Katzan, Jr.

\$18.95

**BASIC: GETTING STARTED By** W. S. Davis 582355-1

582576-7

INTERFACE PROJECTS FOR THE TRS-80 By R. C. Hallgren \$18.95 582466-3

PRINCIPLES OF INTERACTIVE COMPUTER GRAPHICS, 2/e By W. M. Newman & R. F. Sproull 463/387B \$32.50 (Counts as 2 of your 3 books)

THE SMALL COMPUTER CON-**NECTION** By N. L. Shapiro 564/124 \$16.95

THE DEVIL'S DP DICTIONARY By S. Kelly-Bootle 340/226 \$8.50 INTRODUCTION TO WORD-

**STAR**<sup>TM</sup> *By* A. Naiman 582594-5 \$21.95

APPLE PASCAL GAMES By D. Hergert & J. T. Kalash **\$1995** 582521-X

TRS-80 GRAPHICS FOR THE MODEL I AND MODEL III By D.

Kater & S. Thomas 333/033 \$12.95

WORD PROCESSING HAND-**BOOK** By I. Flores 582645-3B \$34.50 (Counts as 2 of your 3 books)

**INVITATION TO FORTH By H.** Katzan, Jr. 582284-9 \$1750

**PROGRAMMING WITH ADA:** An Introduction by Means of Graduated Examples By P. Weg-789/24X \$17.95

## Why YOU should join the Byte Book Club now!

- Best and newest books from ALL publishers! Books are selected from a wide range of publishers by expert editors and consultants to give you continuing access to the best and latest books in vour field.
- Big savings! Build your library and save money too! Savings range up to 30% or more off publishers' list prices—usually 20% to 25%.
- Bonus books! You will immediately begin to participate in our Bonus Book Plan that allows you savings up to 80% off the publishers' prices of many professional and general interest books!
- Convenience! 14-16 times a year (about once every 3-4 weeks) you receive the Club Bulletin FREE. It fully describes the Main Selection

and alternate selections. A dated Reply Card is included. If you want the Main Selection, you simply do nothing—it will be shipped automatically. If you want an alternate selection—or no book at all—you simply indicate it on the Reply Card and return it by the date specified. You will have at least 10 days to decide. If, because of late delivery of the Bulletin you receive a Main Selection you do not want, you may return it for credit at the Club's expense.

As a Club member you agree only to the purchase of three additional books during your first year of membership. Membership may be discontinued by either you or the Club at any time after you have purchased the three additional books. Orders from outside the U.S. cannot be accepted.



Fill out the card and mail today! If the card is missing, write to:

BYTE BOOK CLUB, P.O. Box 582, Hightstown, New Jersey 08520

wrights Inc., Suite 100, 12606 Greenville Ave., Dallas, TX 75243.

Mathemagic, a mathematics-processing program. You can enter mathematical formulas into this program using names for variables, build libraries of formulas, and use arrays of formulas and variables. For the IBM Personal Computer; floppy disk, \$99.95. International Software Marketing Ltd. (see address above).

Millionaire, a stock market simulation game. You can simulate buying and selling stocks, using put and call options, buying on margin, and borrowing against your net worth. The game gives you 15 stocks to manipulate. For the IBM Personal Computer: floppy disk, \$99.95. Blue Chip Software, Suite 125, 19824 Ventura Blvd., Woodland Hills, CA 91364.

muMath/muSimp-80, a mathematics processing package. You can enter mathematical formulas using algebraic notation. This program will simplify the formula and provide the answer. For the IBM Personal Computer; floppy disk, \$300. Microsoft Inc., 10700 Northrup Way, Bellevue, WA 98004.

The Pascal Toolkit, A Pascal utility program for use with MS-DOS. This program features an implementation of turtle graphics, console control commands, printer controls, and serial communications capabilities. For the IBM Personal Computer; floppy disk, \$150. Hi Tech Computer Services, 17 Mein Dr., New City, NY 10956.

Pool 1.5, a high-resolution graphics simulation game. This program allows you to play eight-ball, rotation, nine-ball, or straight pool. It features shot replay and friction control. For the IBM Personal Computer; floppy disk, \$34.95. Innovative Design Software Inc., POB 1658, Las Cruces, NM 88004.

Softspool, a software print-spooler program that creates a user-defined printspooler buffer in memory. It permits output to be sent to a printer while another program is running. For the IBM Personal Computer; floppy disk, \$49.95. Rickerdata, POB 288, Burlington, MA 01803.

Suite 16 Manager, an interface program to IBM PC-DOS. This program simplifies entering commands by providing a menu of command options. You can create your own menus for applications programs. For the IBM Personal Computer; floppy disk, \$60. Softwhere. 2162 Deerfield St., Thousand Oaks, CA 91362.

Visibridge, a Visicalc utility program that enhances report-printing capabilities by providing variable-width columns, column suppression, decimal point alignment, and disk storage. For the IBM Personal Computer; floppy disk, \$81. Solutions Inc., POB 989, Montpelier, VT 05602.

#### **TRS-80**

The BASIC Answer, a processing utility program for creating structured BASIC programs. Designed for use with the LDOS operating system, this utility lets you use labels instead of absolute line numbers. For the TRS-80 Models I and III; floppy disk, \$69. Logical Systems Inc... 11520 North Port Washington Rd., Mequon, WI 53902.

League Registration, a filing system for sports league information (see description under Apple). For the TRS-80 Models I and III; floppy disk, \$150. Market Computing, 201 15th Ave. SW, Puyallup, WA 98371.

Games for the II, a set of five arcade-type games: Skydiver, Star Battle, The Wall, Space Swarm, and Mayhem. Each game features graphics and automatic scorekeeping. For the TRS-80 Model II; 8-inch floppy disk, \$29.95. Maryland Model II Games, 3304 Carlton Ave., Temple Hills, MD 20748.

Pandemonium, a word game. The object of this game is to place 25 random letters onto a playing board matrix to construct three-, four-, or five-letter words. A 6000word dictionary is built into the program. For the TRS-80 Models I and III; floppy disk, \$39.95. Soft Images, 200 Route 17, Mahwah, NJ 07430.

## Other Computers

ACCR, a simple databasemanagement program. You can store, retrieve, search, and edit information about your personal finances or property. This program reguires 16K RAM. For the ZX81/Timex-Sinclair 1000: cassette, \$19.95. R. S. Panwar, 2035 Kentland Dr., Houston, TX 77067.

ADDR, a simple databasemanagement program. You can store, retrieve, search, and edit information. You can also create an address list or home inventory. This program requires 16K RAM. For the ZX81/Timex-Sinclair 1000; cassette, \$19.95. R. S. Panwar (see address above).

The Birthday Program, a program that will display the name of the birthday person, play the "Happy Birthday" song, and display a birthday cake. Enter a secret word to blow out the candles. For the VIC-20: cassette, \$3.95. Soft 4 You. POB 3254. Reston. VA 22090.

The Math Teacher, a tutorial program using color and graphics. This program provides drill instruction in the basics of addition, subtraction, multiplication, and division. It features three levels of difficulty and displays a student's score after 25 problems are answered. For the NEC PC8001A; floppy disk, \$29.95. Computech, Department NEC-MT-BY, POB 7000-309. Redondo Beach. CA 90277.

Text Editor, Assembler, and Disassembler, a set of three programs for assemblylanguage programming. The text editor is a line-oriented editor: the assembler and disassembler are for 8080/Z80 files created by the editor. For the North Star Horizon; floppy disk, \$75. Polaris Software, POB 22825, San Diego, CA 92122.

Utopia, a simulation game in which you become the ruler of a country. You control the economy, food supply, and defense. But beware of the pirates, hurricanes, and rebels. For one or two players. For the Intellevision Master Component; cartridge, \$34.97. Mattel Electronics, 5150 Rosecrans Ave., Hawthorne, CA 90250.■

This is a list of software packages that have been received by BYTE Publications during the past month. The list is correct to the best of our knowledge, but it is not meant to be a full description of the product or the forms in which the product is available. In particular, some packages may be sold for several machines or in both cassette and floppy-disk format, the product listed here is the version received by BYTE Publications.

This is an all-inclusive list that makes no comment on the quality or usefulness of the software listed. We regret that we cannot review every software package we receive. Instead, this list is meant to be a monthly acknowledgment of these packages and the companies that sent them. All software received is considered to be on loan to BYTE and is returned to the manufacturer after a set period of time. Companies sending software packages should be sure to include the list price of the packages and (where appropriate) the alternate forms in which they are available.

## MICROSTAT® - Release 3.0 MICROSTAT® + baZic® = PERFORMANCE

The best just got better! MICROSTAT has been the leader in the statistics field for microcomputers since 1979, and the new release 3.0 outperforms and is noticeably faster than previous versions. Just a few of the features include:

## **GREATER ACCURACY**

BCD with up to 14 digit precision;

#### PROGRAM ENHANCEMENTS

Missing data capabilities and many more;

## **FASTER EXECUTION**

Calculation time greatly reduced;

#### DYNAMIC FILE ALLOCATION

Data can be inserted, added, or deleted;

#### SPECIAL PRICE:

For a limited time get MICROSTAT plus baZic complete with program disk and documentation for each for \$395.00, save \$50.00!

The MICROSTAT - baZic version requires: a Z80 CPU. CP/M™ and 48K of memory. Available formats: 8" SD disk or 51/4" North Star only. Check with your dealer for other formats. Also available for: Microsoft's Basic-80™ North Star DOS and IBM. For more information, call or write:



## ECOSOFT INC.

P.O. Box 68602 Indianapolis, IN 46268-0602 (317) 255-6476



MICROSTAT is a registered trademark of ECOSOFT, INC. baZic is a registered trademark of MICROMIKES. INC CP/M is a registered trademark of DIGITAL RESEARCH Basic-80 is a registered trademark of MICROSOFT



**EPSON** 

MX-80 S389 MX-80 F/T S475 \$599 MX-100



TRS-80 MODEL III

48K \$849 48K, 2 Drives \$1599

Gemini 10 Gemini 15



MODEL 16

MOD 16, 1 Dr. \$4499 MOD 16, 2 Dr. \$4799

COMPUTERS \$4399.95 320K RAM Memory, two 320K Disk Drives, DOS 1 1, Color Graphics Card, Hi-Res, BMC Green Screen Monitor, Parallel Card. RS-232 Serial Card. Clock:Catendar Wordstar and Visicalc 64K RAM Memory, two 320K Disk Drives nd Drive Controller PRINTERS Epson MX-80 5389 MX-80 F/T. MX-100 5599 Okidata \$350 \$425 \$699 \$1049 MI 824

PARALLEL

SERIAL

Smith-Corona T.P.I. ..... \$599.00 Serial or Parallel DISK DRIVES TEAC - Complete with Power Supply & Cabinet 40 Track Single Side S239 40 Track Single Side 80 Track Single Side 80 Track Dual Side FANDON - Complete with \$340 \$340 Supply & Cabinet 40 Track Sirigle Side S239 40 Track Single Side 40 Track Dual Side 80 Track Single Side 80 Track Dual Side TEAC - Bare 5319 40 Track Single Side 40 Track Dual Side S199 \$289 80 Track Dual Side 80 Track Dual Side 80 Track Dual Side TANDON - Bare \$289 \$349 40 Track Single Side 40 Track Dual Side S269 80 Track Single Side S269 80 Track Dual Side



## 12" B&W MONITOR



VIDEO 100 by AMDEK

**FULL FACTORY** WARRANTY

## for APPLE **16K RAM CARD**

Language Transparent COEX FACTORY WARRANTY

## CP/M and PASCAL **DESIGNED** FOR YOUR

APPLE<sup>™</sup> ......

51/4"Floppy DISKETTES

All Certified-100% Guaranteed

Hub Rings...... \$169.00

**FLOPPY DISK DRIVE** 

From Fourth Dimension Systems

with Track Zero Micro Switch

DOS 3.2.1 & DOS 3.3

BOX of 100...

Above with

Controller Card

for above......\$99.00

## COEX 80-FT DOT MATE

- Interface with Apple,™ Centronics RS-232, IEEE-488
- 9x7 Dot Matrix, 80 CPS, Bi-Directional Printing
- 2K Buffered Memory
- 80, 96, 132 Columns, Graphics and Block Printing
- Selectable Char Pitch, Line Spacing and Feed

COEXInterface Card to APPLE \$49.95

80x24 Video Display Card

Vista Computer Company's new Vision-80 board is a sophisticated yet easy to use video display card for the Apple™ computer.

## PARALLEL INTERFACE **EPSON TO APPLE**

New From COEX

\$4995 CABLE

**INCLUDED** 

## PROTOTYPING CARDS

for APPLE.... **\$19.95** for I.B.M..... \$49.95

## **EXTENDER CARDS**

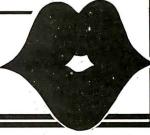
for APPLE ... \$16.95 for I.B.M.... \$19.95

"Have You Kissed Your Computer Lately"

# Components Express,

1380 E. Edinger ● Santa Ana, Calif. 92705 ● 714/558-3972 Terms of Sale: Cash, Checks, Credit Cards, M.O., C.O.D. Calif. residents add 6% sales tax.





# Passing Untyped Parameters in UCSD Pascal

An assembler-language function and a "trick" are combined in a parameter-passing method.

> Eliakim Willner Datronics Inc. 675 Third Ave. New York, NY 10017

Pascal's best feature is that it is strongly typed. The programmer must declare all variable types beforehand as integers within a certain range, real numbers, characters, userdefined, and so on.

But strong typing, while desirable in most situations, can be a hindrance in others. In particular, for certain systems programming applications programmers often have to pass a variable of unspecified type as a parameter to a subroutine. A close look at the parameter-passing schemes available in Pascal shows that the language was not designed for applications requiring untyped parameters.

Because Pascal is a block-structured language, individual tasks within a program are coded as separate functions and procedures. Each module may have protected data that is not accessible from other modules. Data is passed from one module to another by means of one of two pa-

## About the Author

Eliakim Willner is a data-processing consultant specializing in mini- and microcomputer systems. He teaches data processing at Kingsborough Community College of the City University of New York.

rameter-passing schemes. The most common method uses value parameters, which allows the subroutine to have its own copy of the passed parameter. This preserves the integrity of the calling routine's data.

If, on the other hand, the programmer wants the subroutine to return a different value in the parameter instead of the original one, "variable

A method exists that allows the programmer to pass a value of an unspecified type as a parameter to a subroutine.

parameters" may be used. In this instance, the subroutine is given the address of the parameter and performs its manipulations on the original memory locations in the calling routine where the parameter is located.

In keeping with Pascal's strong type-checking features, most compilers and their run-time systems assure that the type of parameter declared in the subroutine matches the type of variable passed from the calling routine. This applies to both parameter-passing schemes I've described, and it would seem to eliminate Pascal as an implementation language for certain systems applications.

Fortunately, however, a method exists that allows the programmer to pass a value of unspecified type as a parameter to a subroutine. Although my example is written for UCSD Pascal Version IV by Softech Microsystems, the method could be adapted easily to other versions of Pascal and other languages. I'll begin with an example of a situation in which a programmer would need to use this technique.

#### Describing a Problem

In a well-designed piece of software, the end user is presented with a completely formatted screen that resembles a blank form, with entry headings and space for the entries. As you make entries, your data is checked for validity. Detailed error messages immediately notify you of your mistakes, and you're given time to correct them.

Constructing this sort of end-user interface takes a significant amount of programming time, and the resulting code constitutes a major portion of the program. A general-purpose utility that enables the application programmer to set up screens and specify valid entries with ease is a valuable tool.

Such a utility has two sections. The first is a stand-alone program that lets the application programmer format each screen. The second section consists of a set of subroutines to be linked to the application program. As soon as the screen is formatted, it is stored as a data file to be used by the subroutines. The subroutines access the data file to set up the screen and guide you through the process of entering the data, performing validity checks, and so on.

To perform validity checks the routines must know which values are acceptable for each entry on the screen. Typically, the utility provides a number of predefined types—a dollars-and-cents type or a date type, for example. The application programmer specifies the type for each entry when the screen is originally set up. Because this information becomes part of the data file for that screen, it is accessible to the utility subroutines.

After the utility subroutines perform their tasks, the validated data is returned to the application program for the necessary processing. The application programmer must specify which variables are to be passed the entered data when the utility subroutines are invoked. Normally this is easily accomplished by writing something like GETSCREEN (VARI-ABLE1, VARIABLE2, . . .). Here GETSCREEN is a utility subroutine and the VARIABLEn (variables) in the application program are passed the data. In our present discussion, however, GETSCREEN is a subroutine in a general-purpose utility.

In one application the data passed back in VARIABLE1 might be an integer, so VARIABLE1 would be declared an integer. But in another application using the utility, VARIABLE1 might accept data of the character type, and it would be declared as such.

Although the utility subroutines know from the data file what kinds of

## ${f Tele Video}^{f \circ}$ ${f Users!}$ NOW 92 WORDSTAR® COMMANDS

The TV2000 is Designed for the 925,950, Intelligent I and 800 Through 816 Computers

### Features:

- 46 single key stroke commands
- 41 shifted commands
- 5 MailMerge commands
- Faster cursor and keyboarding
- User-oriented command selection & location
- Soft switch activates the enhancement with no loss of TeleVideo attributes.

Custom keyboard layout available for special codes or formats



## Includes:

46 replacement key caps Replacement ROM

SUGGESTED RETAIL PRICE \$220

## WordTechSystems

953 Mountain View Dr. Suite 114 Lafayette, California 94549 (415) 254-7747

Trademark Wordstar® MicroPro International—TeleVideo® TeleVideo Systems, Inc. MailMerge® MicroPro International

## COMPUTER GEAR—WHOLESALE!

Purchase your Hardware and Software directly from an OEM/Systems Integrator. Take advantage of our buying power! We stock a full line of Board Level Components, Software, and Peripherals for all the Popular Machines in use today. These include S-100, GODBOUT, MORROW, APPLE, IBM PC, TRS80, OSBORNE, HP, NORTHSTAR, SUPERBRAIN, NEC. Z/H-89, XEROX, and many others. Call for your needs. We'll give you the Lowest Prices, and the Technical Support and Know-How we are quickly becoming well-known for. Satisfied Customers Nationwide! The Nation's Custom Systems House for Business. Education. Science

## **SOME OF OUR CURRENT SPECIALS:**

MICROSOFT MBASIC 80 \$199 • ASHTON-TATE dBASE II \$459 • SYSTEMS PLUS FMS81 \$299 MICROPRO: WORDSTAR \$259, SPELLSTAR \$159, MAILMERGE \$99, PACKAGE-ALL THREE \$489

## COMPUPRO

| Z-80 CPU | \$219  | INTERF 2     | \$189  |
|----------|--------|--------------|--------|
| 8085/88  | \$319  | INTERF 3     | \$445  |
| DISK 1   | \$359  | INTERF 4     | \$269  |
| DISK 2   | \$599  | ENCLOS 2     | \$669  |
| RAM 16   | \$439  | CP/M 2.2     | \$149  |
| RAM 17   | \$399  | CP/M 86      | \$269  |
| INTERF 1 | \$189  | MP/M 816     | \$769  |
| SYS 816A | \$4495 | B: \$5675 C: | \$7299 |

AMD SIN.BD.COMP. \$675 VIO-X2 VIDEO BD \$319 SO SYS VDB-8024 \$459 IBM PC/2DR/MON \$3749 SSM VB2 VIDEO \$199 PERTEC 51/4" DSDD\$125 MORROW MULTI/0 \$279

#### **MORROW DESIGNS**

NEW MICRODECISION COMPLETE COMPUTER (INCLUDES CPIM, WORDSTAR, MBASIC, DISK) 1 DRIVE \$945 NEW 12" GREEN TERMINAL \$499

MA W/CP/M \$439 DJ2D W/CP/M \$349 5K RAM \$429 MULTI I/O \$299 HARD DISK SUBSYSTEMS, DRIVES—CALL DECISION 1 MICROCOMPUTER—CALL DJDMA W/CP/M \$439 65K RAM \$429

SSM VB3A \$399 QUICKCODE \$219 QUICKSCREEN \$129 SANYO 12'' GR(HI RES) \$209 SUPERCALC \$225 TELEVIDEO TERMINAL SALE: 925 - \$749 SANYO 12' GR(HI RES) \$209 AMDEK 300G LIMITED SPECIAL: USI 12' AMBER MONITOR-20MHZ (SHARPER THAN SANYO) \$199 AMDEK 300G \$159 WE ARE THE LARGEST IN THE CUSTOM CONFIGUARTION OF COMPLETE STATE-OF-THE-ART S-100 SYSTEMS, AT PACKAGE PRICING, WITH INTEGRATION, BURN-IN, & PROGRAMMING.

New: CCT Disk Drive Subsystems. Industrial quality 54". 8". floppy and/or hard disk custom configurations. Str highest quality.

DNE 5'4" APPLE/IBM: \$299 DUAL 8" \$500: \$799 DUAL 8" \$500: \$1199 HD SUPER SPECIAL: 8" DUME/5MEG SHUGART: \$1550—W/DMA CONT&CP/M: \$1999

Announcing the CCT SUPER SUPPLY: +8V@ 8 to 30A; ±16V to 3A+; +24 V to 10A+; +12V@ 2A+; 5V@ A well-engineered, compact supply plugable to handle virtually any Maintrame/Floppy/Hard disk combo. Call us

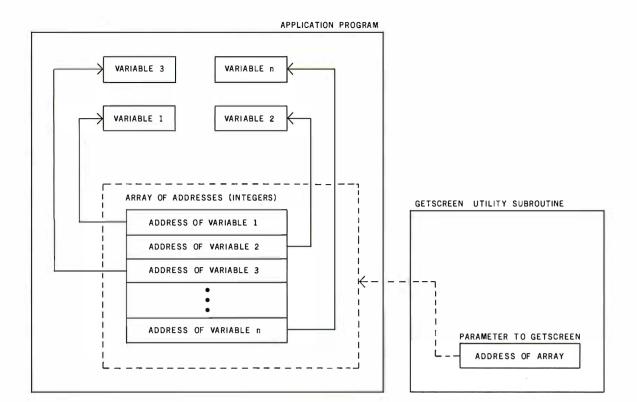
WE HAVE A LARGE STOCK OF IBM PC SOFTWARE. licropro—Microsoft—dBase 11—Spellguard—Supercalc

SPECIAL: MICROSOFT IBM PC 64K RAMCARD — \$299! Call for any CP/M Software—We stock all formats, at big discount

WOW!s\$ SPECIALS \$\$ GOOD THROUGH MONTH END. As supplies last. Rainchecks may be given if possible. Cash Sales Only!

## COMPUTFR

CRAFTSMAN COURT, BOX 4160, SEDONA, ARIZONA, 86340 (602) 282-6299 PRICES & AVAILABILITY SUBJECT TO CHANGE. ALL PRODUCTS NEW, AND CARRY FULL MANUFACTURER'S WARRANTEES CALL FOR CATALOG. FREE TECHNICAL HELP TO ANYONE. WE CAN CONFIGURE BOARDS & SOFTWARE FOR YOUR SYSTEM PLUG-IN & GO. AZ RESIDENTS AOD APPLICABLE SALES TAX. CP/M.TM. DIGITAL RESEARCH



**Figure 1:** Construction of an array in the application program containing the addresses-as-integers of each variable that will receive a value entered onto a screen. The array is passed as a variable parameter to GETSCREEN. GETSCREEN will input and validate the screen entries and then return the values to the variables of the application program using the addresses specified in the array.

values each application needs for the VARIABLEn, the parameters corresponding to the VARIABLEn must be declared. As stated earlier, in Pascal the type of parameter declared in the subroutine must match the type of the corresponding variable in the calling routine. But in this case the author of the utility does not know the type of any of the variables passed from the application. In other words, the programmer needs to pass a value of unspecified type to a subroutine.

### Identifying a Solution

To solve this problem, we will use a method adapted from a technique commonly found in assembler-language programs. This technique is similar to Pascal's variable parameter scheme in that the subroutine does not receive its own copy of a piece of data but instead is given its actual address.

The programmer writes the GETSCREEN routine so that it has only one parameter, an array of integers. Each integer in the array represents the address in memory of one

VARIABLE*n* that will receive a value input to the screen. The array will have as many integers as the screen has data items. (See figure 1.)

GETSCREEN uses these integer/ addresses as though they were variable parameters: it stores each data item entered and verified into the ad-

It is not difficult to write an ADDR function and make it part of the language.

dress specified by the appropriate integer in the array. Note that both the application program and the utility subroutine must explicitly manipulate addresses, while when variable parameters are employed the manipulation and passing of addresses is transparent to the programmer.

Two important questions remain: How does the application program discover the addresses of the VARI- ABLEn to be placed in the array? and How does the utility subroutine use these addresses—which are really just integers—to pass values back to the VARIABLEn?

## Adding a Function

In many languages, discovering the address of a variable is a relatively straightforward procedure. In PL/I, for example, the function ADDR (VARIABLE1) returns the address of VARIABLE1. Pascal does not contain an ADDR function, but writing one is easy, and making it a part of the language is simply a matter of including it in the system library.

The application programmer must write the function in the assembler language of the local processor to find the address of *any* variable, regardless of type. A Pascal subroutine will not permit this, but UCSD Pascal does allow assembler-language subroutines to be written with untyped parameters. The ADDR function shown in listing 1 is written in PDP-11 assembler language but can be adapted easily to any assembler

#### An ADDR Function for Pascal

The following directions will guide you through creating the ADDR function, including it in the system library, and using it in a program.

- 1. Using the system editor, create a text file containing your version of ADDR.
- 2. Make sure that the .OPCODES and .ERRORS files for your assembler are on the system disk. Invoke the assembler by typing "a" at the outer-operating-system level. Respond appropriately to the prompts for text, code, and listing file
- 3. Invoke the library utility by typing "x" at the outer-operating-system level and responding to the prompt with "library" (library, code must be on your system disk). You will be asked to supply an output file name. Type any name ending in ".code" that doesn't already exist on your disk, such as "new.code." When you are prompted for an input file name, type "system. library." Then type "e" to copy all of the segments of your old library to what will become your new

- library. Type "n," then type the name of the code file containing your assembled ADDR function. Type "e" and then "q" to exit the library. Respond to the "notice" prompt by pressing Return.
- 4. Invoke the filer and "c" (change) the name of the system.library to old.library, and of new.code (or whatever you called it) to system.library. If the new system.library works as it should, you can remove the old.library.
- 5. Write the program that will use the ADDR function. Declare it as follows among the function declarations before you declare any function or procedure that uses it:

## **FUNCTION ADDR (VAR** ANYTHING): INTEGER: EXTERNAL:

6. Use the "r" (Run) command at the outer-operating-system level to compile, link, and execute your program. The next time you want to execute your program, type "x" and then the name of the ".code" file created by the linker.

Listing 1: The PDP-11 version of the assembler-language ADDR function. The reader should become familiar with the UCSD Adaptable Assembler (see the UCSD Pascal Users Manual) before attempting to adapt ADDR to other processors.

```
addr 1
 func
 ;this function returns as its value
 ;the address of its single parameter
 ;pop the return address and save it.
 mov
 (sp) + ,return
 ;address of parameter. pop and save.
 (sp) + ,address
 mov
 tst
 + (as)
 ;pop the junk.
 ;return addr of param to top of stack.
 mov
 address, -(sp)
 imp
 @return
 ;depart to calling routine.
return
 .word
address
 .word
```

language supported by the UCSD system. (Complete instructions to assemble ADDR and include it in the system library are given in the text box.)

.end

The routine itself is quite simple. When a function with variable parameters is invoked in the UCSD system, the interpreter pushes one word of what is for our purposes "junk"

onto the system stack, pushes the addresses of the variable parameter(s), and pushes the return address. After the function returns, the interpreter expects to find these elements removed from the stack and the value of the function on top of the stack.

Because our ADDR function returns the address of its parameter as its value, it simply pops the return address and saves it, pops the address of the parameter and holds it momentarily, and pops the "junk" and discards it. Then it replaces the address of the parameter on top of the stack as the returned value and branches back to the calling routine.

The ADDR function must be declared an external routine in the application program. To use the function, the application programmer declares an array of integers whose size is the maximum number of entries permitted for a screen. The number of entries for a particular screen may be stored in that screen's data file or passed as an additional parameter to GETSCREEN. Before GETSCREEN is invoked, the ADDR function is applied to each variable that will hold a validated screen value (the VARIABLEn), and the resulting integer-form addresses are assigned to successive elements of the array (see listing 2).

## Using a Trick

As soon as the utility subroutine receives the array of addresses, it must be able to use them to store the entered and validated data items in the appropriate places. The problem is that in Pascal and most other languages, the closest you can come to touching addresses is via pointers. And although pointers are really just addresses and addresses are really just integers. Pascal does not allow the pointers and addresses to mix. To sidestep this restriction you must employ one of Pascal's more infamous tricks—using a variant record to define the same storage location as both an integer and a pointer (see listing 3).

A variant record is required for each possible data type that the VARIABLEn of the application program may assume. Listing 3 contains variant records for the integer and character types called INT\_ POINTER and CHAR\_POINTER. These variant records contain no tag field; the "CASE INTEGER OF 1: . . . 2: ..." is a device to enable the utility subroutines to refer to each variant record under two aliases.

When, for example, the alias

## **TELEVIDEO DEALERS & DIST.**

Our general accounting programs operate on  $CP/M^1$  &  $MP/M^2$ compatible systems, including TurboDos3 and MMMost4.

- C.A.T.S. (3 levels of User help —
   Computer Assisted Tutorial Software.
- 2. OUTSTANDING DOCUMENTATION.
- 3. MULTI-USER (w/file & record tock.)
- 4. MULTI-COMPANY (w/consolidation)
- 5. FULLY INTEGRATED w/single source entry (or stand alone)

### MONEY BACK GUARANTEE

COUGAR MOUNTAIN SOFTWARE

10 S. Latah Box 6886 Boise, Idaho 83707 208-344-2540

TM: I. & 2. Digital Research; 3. Software 2000; 4. TelcVideo.

## age vears worked retirement benefits

END.

The U.S. Department of Labor has a free booklet that will help you answer these questions and a lot more. Send for It today. Write: Pensions, Consumer Information Center, Pueblo, Colorado 81009

U.S. Department of Labor

Bill Cosby hen you learn CPR,

Red Cross

Listing 2: Skeleton application program illustrating how the table of addresses is declared, filled, and sent to the utility subroutine.

```
CONST
 MAX_ENTRIES_PER_SCREEN = 100;
 {OR WHATEVER}
TYPE
 TABLE_TYPE = ARRAY [1 . . MAX_ENTRIES_PER_SCREEN] OF INTEGER;
VAR
 TABLE_OF_ADDRESSES : TABLE_TYPE;
 VARIABLEI
 : CHAR;
 {FOR EXAMPLE}
 VARIABLE2
 : {WHATEVER THEY MAY BE}
```

FUNCTION ADDR (VAR ANYTHING): INTEGER; EXTERNAL;

PROGRAM APPLICATION\_SKELETON;

```
BEGIN
 TABLE_OF_ADDRESSES[1]: = ADDR (VARIABLE1);
 TABLE_OF_ADDRESSES[2]: = ADDR (VARIABLE2);
 GETSCREEN (TABLE_OF_ADDRESSES);
```

**Listing 3:** Skeleton utility subroutine illustrating how the table of addresses is used to send validated values back to the application program.

```
TYPE
 INT_POINTER = RECORD
 CASE INTEGER OF
 l: (POINTER_AS_INTEGER: INTEGER);
 : finteger)
 2 : (POINTER
 END;
 CHAR_POINTER = RECORD
 CASE INTEGER OF
 1 : (POINTER_AS_INTEGER : INTEGER);
 2 : (POINTER
 : 1CHAR)
 END;
VAR
 : INT_POINTER;
 CHARACTER : CHAR_POINTER;
 : CHAR;
BEGIN
```

PROCEDURE GETSCREEN\_SKELETON;

(FOR THE PURPOSE OF THIS EXAMPLE ASSUME THAT GETSCREEN HAS ALREADY DETERMINED THAT THE FIRST SCREEN ITEM IS OF TYPE CHAR AND HAS BEEN INPUT TO THE LOCAL VARIABLE CH.}

CHARACTER.POINTER\_AS\_INTEGER := TABLE\_OF\_ADDRESSES[1].

(THE POINTER TO CHARACTER IN ITS INTEGER GUISE IS SET EQUAL TO THE ADDRESS OF VARIABLE1 IN ITS INTEGER GUISE.}

CHARACTER.POINTER! := CH:

(VOILA! VARIABLE) IN THE APPLICATION NOW CONTAINS THE FIRST SCREEN VALUE.}

END.

CHARACTER POINTER AS INTEGER is used, CHAR\_ POINTER may be manipulated as any integer. The utility, knowing that a particular address in the array of integer/addresses passed to it by the application program belongs to a variable of type character, may take that

integer/address and assign it to CHARACTER.POINTER AS INTEGER.

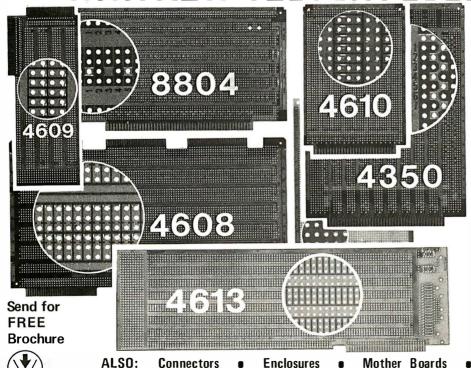
Once that happens, any reference to CHARACTER.POINTER† is a reference to a character variable in the application program. Thus, as soon as the utility subroutine GETSCREEN

has accepted and validated an input of type character, it only has to assign it to CHARACTER.POINTER1 and the data will be transported back to the application.

Because the utility knows from the data file what type variable each screen entry must be assigned to, it can take the corresponding address from the array and move it into the appropriate variant record. When the value itself is assigned to the pointedto location, it lands exactly where the application expects to find it.

A parameter or parameters of unspecified type may be passed to a subroutine in Pascal. Purists may object to such tricks and pragmatists may point to other languages where machinations like these are unnecessary. But in defense of Pascal, few languages provide such a rich and balanced variety of features. To the credit of its designer and its implementers at UCSD, Pascal is flexible enough to accommodate situations for which it was not originally intended.■

# BUILD YOUR COMPUTER BREADBOARDS



New 4613 series — for IBM Personal Computer. models available.

New 4614, 4615 series - for VME Bus. Six models available.

4610 series - for STD-Bus. Three models available.

4608 series — for Multibus solderable, or unpatterned.

8804 series - for S-1 00. Seven models available.

4607 - for DEC LSI-11/PDP8-11, Heath-11,

4609 — for Apple II, Super-Kim, Pet Commodore with Expandamem.

4350 - for TI 980

4611 series — for Motorola Exorciser

Extenders 748209 VECTOR ELECTRONIC COMPANY, Inc., 12460 Gladstone Ave., P.O. Box 4336, Sylmar, CA 91342-0336; (213) 365-9661

# A Terminal Program for the TRS-80 Model III

A world of information is just a phone call away.

Ralph L. James Department of Mathematics California State College Turlock, CA 95380

Imagine having these resources available to your TRS-80 Model III: general-use databases such as The Source and Compuserve, research-oriented databases such as Dialog, specialized databases covering practically any subject, and electronic bulletin boards for any interest. If the prospect appeals to you, all you need to do is transform your Model III into a "smart" terminal. Your telephone will do the rest.

Before attempting the conversion, you'll need two things. First, you must have a serial port (e.g., an RS-232C board) so that your Model III can communicate via a modem over the telephone lines. Of course, you'll also need a program that enables the computer to perform as a terminal. I wrote such a program for my TRS-80 Model III and have used it successfully over the past few months.

Several features of the TRS-80 Model III make it attractive for use as a terminal. First, its Control key (shift down-arrow) lets you enter control characters from the keyboard. On most larger computers, these characters control the operating system. For example, you might use Control-C to terminate program execution. A second important feature of the Model III is an (optional) RS-232C serial-interface board. I particularly like a couple of other features, such as the lowercase characters and the single-unit design of

the Model III that incorporates the video display, keyboard, and disk drives. The only disadvantage of the Model III is that its screen has 64 columns instead of the usual 80. But for my work, at least, that hasn't been a serious drawback.

I wrote the terminal program in Z80 assembly language, which operates at 300 bits per second (bps), the most frequently used speed for remote terminals that communicate over the telephone line (chances are it would work satisfactorily at higher transmission rates, but that hasn't been tested). Note that the program is written only for the TRS-80 Model III and will not run on a Model I.

The program requires one or two disk drives and a minimum of 32K bytes of RAM (random-access read/write memory). The terminal program supports disk operations. For example, you can store a program on one of your disks and then either send it to the remote computer or store the output from the remote computer on a disk. If you have no disk drives and only 16K bytes of RAM, you can still use the program by simply eliminating the disk-related section (I will explain this in detail later).

If you want listings or hard copy of output from the remote computer, you can use a parallel printer. Again, the program will work even if you don't have a printer. You can either eliminate the printer-related sections of the program or disregard the printer-related commands.

I designed the terminal program (see listing 1) to access a PDP-11/45 minicomputer with version 7.0 of the RSTS/E operating system. A different operating system or computer may call for some changes to the program. I tried to make it as flexible and universal as possible so that no major changes should be necessary.

You may want to custom design the program to suit your particular needs. That way, you can incorporate the features you need and eliminate those you don't. (Hereafter, I will use "computer" to refer to the remote computer and "Model III" to refer to the TRS-80 Model III to avoid confusion between the two.)

## Initializing the RS-232C Interface

The main section of the program, which allows the Model III to communicate with the computer (without printer or disk capability), is very simple. (See figure 1 for an illustration of its operation.) First, the RS-232C interface is initialized. A "don't wait" condition is necessary, so in line 480 of the program a 0 is loaded into location 16890. In line 500, all the bits in location 16889 are set to 1 by calling RSINIT (I needed an 8-bit word length with 1 stop bit and no parity; the eighth bit is ignored. Call your computer center or system

**Listing 1:** Model III terminal program. This listing contains all options for use with a printer and disk drives.

#### SOURCE LISTING FOR TERMINAL PROGRAM

| 00100 ORG                            | 5400H                 |                                                    |
|--------------------------------------|-----------------------|----------------------------------------------------|
| 00110 ;*******                       | MAIN PROGRAM CONST    | ANTS *******                                       |
| 00120 DUPLEX EQU                     | 5200H                 | ; DUPLEX FLAG                                      |
| 00130 KBCHAR EQU                     | 002BH                 | ;KEYBOARD SCAN                                     |
| 00140 VDCLS EGU<br>00150 VDCHAR EGU  | 01C9H                 | ;CLS<br>;VIDEO DISPLAY                             |
| 00160 RSINIT EQU                     | 0033H<br>005AH        | ;INITALIZE RS232                                   |
| 00170 RSRCV EGU                      | 0050H                 | RS232 RECEIVE                                      |
| 00180 RSTX EQU                       | ØØ55H                 | ;RS232 XMT                                         |
| 00190 CHAR EGU                       | 5202H                 | ; CHAR STORAGE                                     |
| 00200 RCVBYT EGU                     | 16872                 | RCV LOCATION RS232                                 |
| 00210 CURSOR EGU<br>00220 CURLOC EQU | 1 43<br>4020H         | ;CURSOR CHARACTER<br>;CURSOR ADDRESS               |
| 00230 ;******                        |                       | ***********                                        |
| 00240 PRCHAR EQU                     | 003PH                 | ;LINE PRINTER ROUTINE                              |
| 00250 BUFLAG EGU                     | 5201H                 | BUFFER FLAG                                        |
| 00260 BUFPTR EQU                     | 5203H                 | BUFFER POINTER                                     |
| 00270 BUFNUM EQU<br>00280 BUFBEG EQU | 5205H<br>5800H        | ;BUFFER COUNT<br>;FIRST BUFFER LOC                 |
| 00290 ;******                        |                       | ********                                           |
| 00300 XMTBYT EQU                     | 41FØH                 | ;RSTX BUFFER                                       |
| 00310 DOS EQU                        | 4:02DH                | ;TRSDOS                                            |
| 00320 DCB EQU                        | 5207H                 | DCB FOR A DISK FILE                                |
| 00330 ERNL EQU                       | 5213H                 | LSB OF ERN                                         |
| 00340 ERNM EQU<br>00350 EOF EQU      | 5214H<br>520FH        | MSB OF ERN                                         |
| 00360 CTRD EQU                       | 5239H                 | <pre>;# BYTES IN LAST RECORD ;RECORD COUNTER</pre> |
| 00370 BUFFER EGU                     | 5238H                 | ;1ST ADDR OF DISK BUFFER                           |
| 00380 READ EQU                       | 4.4336H               | READ RECORD FROM DISK                              |
| 00390 CLOSE EQU                      | 4428H                 | CLOSE FILE                                         |
| 00400 OPEN EQU                       | 4424H                 | SOPEN FILE                                         |
| 00410 INIT EQU                       | 442ØH                 | FOPENS NEW FILE                                    |
| 00420 WRITE EQU<br>00430 TEMPST EQU  | 4439H<br>533BH        | ;WRITE RECORD TO DISK<br>;TEMP STORAGE FOR SCREEN  |
| 00440 LINE DEFM                      |                       |                                                    |
|                                      | ******                |                                                    |
| 00460 CALL                           |                       | ; CLS                                              |
| 00470 XOR                            | A                     | :ZERO A REGISTER                                   |
| 00480 LD<br>00490 LD                 | (1689Ø),A             | NO WAIT CONDITION                                  |
| 00490 LD<br>00500 LD                 | A,255<br>(16889),A    | ;SET UP RS232<br>;INITALIZE RS232                  |
| 00510 CALL                           |                       | ;INITALIZE RS232                                   |
| 00520 XOR                            | A                     | ; ZERO A                                           |
| 00530 LD                             | (BUFLAG) + A          | ;BUFFER CLOSED                                     |
| 00540 LD                             | (DUPLEX), A           | HALF DUPLEX                                        |
| 00550 CALL                           |                       | ;INITALIZE BUFFER                                  |
| 00560 RCV CALL<br>00570 LD           | Ay (RCVBYT)           | ;CHECK RS232 RECEIVE<br>;PUT CHAR IN A             |
| 00580 JR                             | Z, KEYBD              | ; IF NO CHAR, GO                                   |
| 00590 CP                             | 10                    | LINE FEED?                                         |
| 00600 JR                             | Z · RCV               | ; IF SO IGNORE IT                                  |
| 00610 LD<br>00620 CALL               | (CHAR),A              | SAVE CHAR                                          |
| 00620 CALL<br>00630 LD               | . VIDEO<br>A,(BUFLAG) | ;PRINT CHARACTER<br>;BUFFER STATUS                 |
| 00640 CP                             | 0                     | BUFFER CLOSED?                                     |
| 00650 JR                             | Z, KEYBD              | ; IF SO GO                                         |
| 00660 CALL                           | BUFPUT                | ; PUT CHAR IN BUFFER                               |
| 00670 KEYBD CALL                     |                       | ; CHECK KEYBOARD                                   |
| 00680 JR                             | Z + RCV               | ;GO CHECK RS232 IF NO CHAR<br>;SAVE CHAR           |
| 00690 L.D<br>00700 CP                | (CHAR),A<br>2         | TURN BUFFER ON?                                    |
| 00710 JP                             | Z,BUFON               | ; IF SO, GO DO IT                                  |
| 00720 CP                             | 15                    | ;TURN BUFFER OFF?                                  |
| 00730 JP                             | Z,BUFOFF              | ; IF SO, GO DO IT                                  |
| 00740 CP                             | 5                     | ;ERASE BUFFER?                                     |
| 00750 JP<br>00760 CP                 | Z:BUFER<br>16         | ; IF SO, GO DO IT<br>; PRINT BUFFER?               |
| 00770 JP                             | Z, BUFPR              | ; IF SO, GO DO IT                                  |
| 00780 CP                             | 1                     | BREAK KEY?                                         |
| 00790 JP                             | Z,DOS                 | ; IF SO, RETURN TO DOS                             |
| 00800 CP                             | 18                    | ;CTRL/R<br>;IF NOT, GO                             |
| 00810 JR<br>00820 PUSH               | NZ,SET1<br>H AF       | SAVE A                                             |
|                                      |                       |                                                    |

Listing 1 continued on page 460



Now, pay less and get great service, too!

Finest, easiest-to-use accontig system for Apple Franklin Computers. Now at a special *Introd ctory Discount Price*. Uses 6502 machine language. Cornes with its own firmware card. Upgradable and filly in egrated. Price includes or complete customer's poort package. Call Toll Free (200) 227, 77(1)

(800) 327-7701 InFla., collect: (305) 757-5416.

Software Management Group, Inc. 12555 Biscayne Bo levard, Suite 805 Dept. BY, Miami, Florida 33181

\*Apple and Accounting Plus II are trademarks of Apple Computer, Inc. and Software Dimensions, Inc., respectively.

Circle 473 on inquiry card.

## **COMPUTERS**

| FRANKLIN ACE 1000\$9          | 39  |
|-------------------------------|-----|
| SYSCOM\$6                     | 99  |
| IBM/PC\$27                    |     |
| (64K-2 DISK DRIVES-COLOR BOAI | RD) |
| COLUMBIA MPC                  |     |
| (IBM CLONE—128K)\$29          | 50  |
| ALTOS - EAGLE - ATARI - OSBO  |     |
|                               |     |

## **PRINTERS**

| NEC 3550 (FOR IBM P/C) \$1995                                                   |
|---------------------------------------------------------------------------------|
| NEC 3510 (EX)\$1475                                                             |
| NEC 3515 (EX)\$1499                                                             |
| IDS MICROPRISM \$579                                                            |
| C. ITOH PRINTMASTER\$1695                                                       |
| OKIDATA 82A\$429                                                                |
| Send for FREE Brochure of our Complete<br>Line of Monitors, Terminals and more. |

## COMPUTERS and more

2420 University Ave., Sulte 3, San Diego, Ca. 92104 (619) 291-1442, Telex 697120, Datamax Attn: Dept. 322

Circle 474 on inquiry card.

## **DON'T READ THIS**

UNLESS YOU ARE INTERESTED IN SOPHISTICATED SOFTWARE WITH EXCELLENT DOCUMENTATION.

Our general accounting programs operate on CP/M¹ & MP/M² compatible systems, including TurboDos³ and MMMost⁴.

- C.A.T.S. (3 levels of User help Computer Assisted Tutorial Software.
- 2. OUTSTANDING DOCUMENTATION.
- 3. MULTI-USER (w/file & record lock.)
- 4. MULTI-COMPANY (w/consolidation)
- FULLY INTEGRATED w/single source entry (or stand alone)

DEALER INQUIRIES INVITED

## MONEY BACK GUARANTEE

COUGAR MOUNTAIN SOFTWARE 10 S. Latah Box 6886 Boise, Idaho 83707 208-344-2540

TM: I. & 2. Digital Research; 3. Software 2000; 4. TeleVideo.



SCORE HIGHER ON THE SAT USING THIS 5 1/4 INCH DISKETTE ON THE APPLE COMPUTER. DRILLS ON MATH, READING, GRAMMAR, STANDARD WRITTEN ENGLISH, ANTONYMS, AND ANALOGY. EXPLAINS RIGHT AND WRONG ANSWERS. SAT.....\$33.95 HIGH SCHOOL ENTRANCE EXAMS.. \$25.00 DELIVERY IN 3-5 DAYS. SEND MONEY ORDER TO OR CALL: FINER PROGRAMMING SERVICE 7310 PARKDALE AVENUE CINCINNATI, OHIO 45237 (513) 761-0380

Circle 463 on inquiry card.

## Like-new products



For free catalog, phone toll-free (800) 225-1008 In Massachusetts (617) 938-0900

#### Genstar REI Sales Company

6307 DeSoto Ave., Ste. J / Woodland Hills, CA 91367

Circle 464 on inquiry card.

## micro-PROLOG

the fifth generation language for micros

- μ-PROLOG is an interactive version of PROLOG currently available for CP/M 2.xx Z80's.
- PROLOG is the Artificial Intelligence language chosen by Japan as the core language for their Fifth Generation Computers.
- PROLOG grew out of AI research in computational logic, PROLOG means PROgramming in LOGic.
- A PROLOG program comprises a set of facts and rules, It relational data and relational queries, recursive list processing, spattern directed rule based programming, within a single framework of logic programming.
- Current applications; Expert Systems, Natural Language Understanding, Intelligent Data Bases.

Distribution Formats 5": North Star, Zenith Z89, IBM PC (with Z80 card) Apple II (Z80 card, lower case reqd), Osborne 8": \$5\50 IBM 3740

Need more info?

Prices Software (with \$275 Manual & Primer) Primer \$15 Prices include air P&P

Sample the language with the 160 page Primer. Price can be set against software.

LOGIC PROGRAMMING ASSOCIATES Ltd. 10 BURTWOOD CLOSE, LONDON SW18, ENGLAND

CP/M TM Digital Research Inc., Z80 TM Zilog Corporation, micro-PROLOG & µ-PROLOG TM LPA Ltd.

#### Listing 1 continued:

| 2.08                                                                                                                                                                                                                                      | 1 commue                                                                             | u.                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 00830                                                                                                                                                                                                                                     |                                                                                      | JP                                                                                                                                                              | DISKRD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | GO READ FILE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 00840                                                                                                                                                                                                                                     | SET1                                                                                 | CP                                                                                                                                                              | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CTRL/F ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 100850<br>100860                                                                                                                                                                                                                          |                                                                                      | JR<br>PUSH                                                                                                                                                      | NZ,SET2<br>AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ;IF NOT, GO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 00370                                                                                                                                                                                                                                     |                                                                                      | JP                                                                                                                                                              | DISKRD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ;SAVE A<br>;GO READ FILE AND SEND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 100880                                                                                                                                                                                                                                    | SET2                                                                                 | CP                                                                                                                                                              | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ;CTRL/G ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 00890                                                                                                                                                                                                                                     |                                                                                      | JP                                                                                                                                                              | Z, BUFXMT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | GO XMT BUFFER TO COMPUTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 00900                                                                                                                                                                                                                                     |                                                                                      | CP                                                                                                                                                              | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ;CTRL/J ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 00910                                                                                                                                                                                                                                     |                                                                                      | JP<br>CP                                                                                                                                                        | Z, PAU2<br>23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ; IF SO, CONTINUE SENDING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 00930                                                                                                                                                                                                                                     |                                                                                      | JP                                                                                                                                                              | Z,DISKSV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ;CTRL/W ?<br>;WRITE BUFFER TO DISK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 00940                                                                                                                                                                                                                                     |                                                                                      | CP                                                                                                                                                              | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CTRL/D ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 00.750                                                                                                                                                                                                                                    |                                                                                      | JR                                                                                                                                                              | NZ, SET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ; IF NOT, GO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 00960                                                                                                                                                                                                                                     |                                                                                      | LD                                                                                                                                                              | A, (DUPLEX)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GET DUPLEX FLAG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 00970                                                                                                                                                                                                                                     |                                                                                      | XOR<br>LD                                                                                                                                                       | 1<br>(DUPLEX),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ;TOGGLE FLAG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 00990                                                                                                                                                                                                                                     |                                                                                      | JΡ                                                                                                                                                              | RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ;SAVE FLAG<br>;GO BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 01000                                                                                                                                                                                                                                     | SET                                                                                  | CP                                                                                                                                                              | 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CARRIAGE RETURN 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 'p1010                                                                                                                                                                                                                                    |                                                                                      | JR                                                                                                                                                              | Z,XMT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ; IF SO, SEND IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 01020<br> 01030                                                                                                                                                                                                                           |                                                                                      | LD                                                                                                                                                              | A, (DUPLEX)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | DUPLEX FLAG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01040                                                                                                                                                                                                                                     |                                                                                      | CP<br>JR                                                                                                                                                        | Ø<br>NZ÷XMT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ;HALF DUPLEX?<br>;IF FULL DUPLES; DON'T PRINT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 01050                                                                                                                                                                                                                                     |                                                                                      | CALL                                                                                                                                                            | VIDEO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TE FOLL DOPLEST DON T FRINT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01060                                                                                                                                                                                                                                     | XMT                                                                                  | LD                                                                                                                                                              | As (CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | FRESTORE CHAR TO A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 01070                                                                                                                                                                                                                                     |                                                                                      | CALL                                                                                                                                                            | RSTX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | :XMT_CHARACTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 01080                                                                                                                                                                                                                                     | ; * * * * * * * * *                                                                  | JP                                                                                                                                                              | RCV DETAILS SHA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | START OVER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 01100                                                                                                                                                                                                                                     |                                                                                      | LD                                                                                                                                                              | A. (CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | R ON VIDEO ********* ;GET CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 01110                                                                                                                                                                                                                                     |                                                                                      | PUSH                                                                                                                                                            | HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ; SAVE. HL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01120                                                                                                                                                                                                                                     |                                                                                      | CP                                                                                                                                                              | 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CARRIAGE RETURN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 01130                                                                                                                                                                                                                                     |                                                                                      | JR                                                                                                                                                              | Z+CURS2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ; IF SO, GO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01140                                                                                                                                                                                                                                     |                                                                                      | CP                                                                                                                                                              | 6<br>N7 0000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | BACKSPACE ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01160                                                                                                                                                                                                                                     | CURS?                                                                                | JR<br>LD                                                                                                                                                        | NZ,CURS<br>HL,(CURLOC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ; IF NOT, GO<br>; CURSOR LOCATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 01170                                                                                                                                                                                                                                     | CONDI.                                                                               | L.D                                                                                                                                                             | A, 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | *BLANK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 01180                                                                                                                                                                                                                                     |                                                                                      | L.D                                                                                                                                                             | (HL):32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | BLANKS PREVIOUS CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 01190                                                                                                                                                                                                                                     | ALIBO                                                                                | LD                                                                                                                                                              | A <sub>2</sub> (CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | RESTORE CHAR TO A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 01200<br>01210                                                                                                                                                                                                                            | COND                                                                                 | CALL.<br>LD                                                                                                                                                     | VDCHAR<br>HL,(CURLOC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ;PRINT CHAR<br>;GET CURSOR LOCATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 01220                                                                                                                                                                                                                                     |                                                                                      | LD                                                                                                                                                              | A) CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | CURSOR HAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 01230                                                                                                                                                                                                                                     |                                                                                      | L_D                                                                                                                                                             | (HL),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRINT CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 01240                                                                                                                                                                                                                                     |                                                                                      | LD                                                                                                                                                              | A, (CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RESTORE CHAR TO A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 01250<br>01260                                                                                                                                                                                                                            |                                                                                      | POP                                                                                                                                                             | Hl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RESTORE HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                           |                                                                                      |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                           | *******                                                                              | RET                                                                                                                                                             | BUFON - TURNS BUFFE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ER ON ********                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                           |                                                                                      |                                                                                                                                                                 | BUFON - TURNS BUFFE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ER ON *******                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 01270<br>01280<br>01290                                                                                                                                                                                                                   |                                                                                      | ***<br>LD<br>LD                                                                                                                                                 | A,1<br>(BUFLAG),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BUFFER OPEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01270<br>01280<br>01290<br>01300                                                                                                                                                                                                          | BUFON                                                                                | LD<br>LD<br>JP                                                                                                                                                  | A,1<br>(BUFLAG),A<br>RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ;BUFFER OPEN<br>;GO BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 01270<br>01280<br>01290<br>01300<br>01310                                                                                                                                                                                                 | BUFON ;*****                                                                         | LD<br>LD<br>JF                                                                                                                                                  | A,1<br>(BUFLAG),A<br>RCV<br>BUFOFF - TURNS BUFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ;BUFFER OPEN<br>;GO BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 01270<br>01280<br>01290<br>01300<br>01310                                                                                                                                                                                                 | BUFON                                                                                | LD<br>LD<br>JP                                                                                                                                                  | A,1<br>(BUFLAG),A<br>RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ;BUFFER OPEN<br>;GO BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320                                                                                                                                                                                        | BUFON ;*****                                                                         | LD<br>LD<br>JP<br>***<br>XOR<br>LD                                                                                                                              | A,1<br>(BUFLAG),A<br>RCV<br>BUFOFF - TURNS BUFF<br>A<br>(BUFLAG),A<br>RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01330<br>01340<br>01350                                                                                                                                                             | BUFON<br>;******<br>BUFOFF<br>;******                                                | LD<br>LD<br>JP<br>***<br>XOR<br>LD<br>JP                                                                                                                        | A,1<br>(BUFLAG),A<br>RCV<br>BUFOFF - TURNS BUFF<br>A<br>(BUFLAG),A<br>RCV<br>BUFPR - DUMPS FROM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | :BUFFER OPEN :GO BACK FER OFF ********* :BUFFER CLOSED :GO BACK BUFFER TO PRINTER *********                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01330<br>01340<br>01350<br>01360                                                                                                                                                    | BUFON<br>;******<br>BUFOFF<br>;******                                                | LD<br>JP<br>***<br>XOR<br>LD<br>JP                                                                                                                              | A,1<br>(BUFLAG),A<br>RCV<br>BUFOFF - TURNS BUFF<br>A<br>(BUFLAG),A<br>RCV<br>BUFPR - DUMPS FROM<br>HL,(BUFNUM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER = ********* :NUMBER OF CHARS IN BUFF                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01330<br>01340<br>01350<br>01360<br>01370                                                                                                                                           | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>LD<br>JP<br>***<br>XOR<br>LD<br>JP                                                                                                                        | A,1<br>(BUFLAG),A<br>RCV<br>BUFOFF - TURNS BUFF<br>A<br>(BUFLAG),A<br>RCV<br>BUFPR - DUMPS FROM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | :BUFFER OPEN :GO BACK FER OFF ********* :BUFFER CLOSED :GO BACK BUFFER TO PRINTER *********                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01330<br>01340<br>01350<br>01360<br>01370<br>01380<br>01390                                                                                                                         | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>JP<br>XOR<br>LD<br>JP<br>XXOR<br>LD<br>JP<br>XXX<br>LD<br>LD<br>CD<br>OR<br>JR                                                                            | A,1 (BUFLAG),A RCV BUFLAG),A (BUFLAG),A RCV BUFPR — DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01330<br>01350<br>01350<br>01360<br>01360<br>01370<br>01380                                                                                                                         | BUFON  ;******  BUFOFF  ;*******  BUFFR                                              | LD<br>LD<br>JP<br>***<br>XOR<br>LD<br>JP<br>****<br>LD<br>LD<br>OR<br>JR<br>JP                                                                                  | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOF1 RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER = ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK                                                                                                                                                                                                                                                                                                                                                                                          |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01350<br>01350<br>01350<br>01370<br>01380<br>01370<br>01380<br>01400<br>01410                                                                                                       | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>LD<br>JP<br>****<br>XOR<br>LD<br>JP<br>****<br>LD<br>LD<br>CR<br>JR<br>JP<br>LD<br>LD<br>JR<br>JP                                                         | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR                                                                                                                                                                                                                                                                                                                                                                         |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01350<br>01350<br>01350<br>01370<br>01380<br>01370<br>01380<br>01400<br>01410                                                                                                       | BUFON  ;******  BUFOFF  ;*******  BUFFR                                              | LD<br>LD<br>JP<br>***<br>XOR<br>LD<br>JP<br>****<br>LD<br>LD<br>OR<br>JR<br>JP                                                                                  | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOF1 RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER = ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK                                                                                                                                                                                                                                                                                                                                                                                          |
| 01270<br>01280<br>01290<br>01390<br>01310<br>01320<br>01350<br>01350<br>01350<br>01360<br>01370<br>01380<br>01400<br>01410<br>01420<br>01440                                                                                              | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>LD<br>JP<br>****<br>LD<br>JP<br>****<br>LD<br>CR<br>JR<br>JP<br>LD<br>DCR<br>JR<br>JP<br>LD<br>DCR<br>JP<br>LD<br>CR<br>JP<br>LD<br>CR<br>JP              | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT:IT=                                                                                                                                                                                                                                                                                                                                               |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>01350<br>01350<br>01370<br>01380<br>01390<br>01400<br>01420<br>01420<br>01450                                                                                              | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>LD<br>JP<br>****<br>XOR<br>LD<br>JP<br>****<br>LD<br>OR<br>JR<br>JP<br>LD<br>LD<br>DP<br>LD<br>LD<br>CALL<br>CALL                                         | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L. NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | :BUFFER OPEN :GO BACK FER OFF ********* :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT                                                                                                                                                                                                                                                                                                                                                         |
| 01270<br>01280<br>01290<br>01390<br>01310<br>01320<br>01330<br>01340<br>01350<br>01350<br>01370<br>01490<br>01420<br>01420<br>01420<br>01450<br>01460                                                                                     | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>LD<br>JP<br>****<br>XOR<br>LD<br>JP<br>****<br>LD<br>OR<br>JR<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD               | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD                                                                                                                                                                                                                                                                                                                                |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>01350<br>01350<br>01370<br>01380<br>01390<br>01400<br>01420<br>01420<br>01450                                                                                              | BUFON  ;******  BUFOFF  ;*******  BUFPR                                              | LD<br>LD<br>JP<br>****<br>XOR<br>LD<br>JP<br>****<br>LD<br>OR<br>JR<br>JP<br>LD<br>LD<br>DP<br>LD<br>LD<br>CALL<br>CALL                                         | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L. NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT:IT=                                                                                                                                                                                                                                                                                                                                               |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>01350<br>01350<br>01370<br>01380<br>01390<br>01400<br>01420<br>01420<br>01450<br>01450<br>01450<br>01460<br>01470<br>01480                                                 | BUFON  ;******  BUFOFF  ;*******  LOP1  PTLOOP                                       | LD<br>LD<br>JP<br>****<br>*XOR<br>LD<br>JP<br>****<br>LD<br>OR<br>JR<br>JP<br>LD<br>LD<br>LD<br>LD<br>LD<br>LD<br>CALL<br>CALL<br>POP<br>CP                     | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******* :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C7 :STOP PRINT, GO BACK                                                                                                                                                                                                                                                                                                  |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>013560<br>013560<br>01470<br>01410<br>01420<br>01420<br>01450<br>01470<br>01470<br>01470<br>01470<br>01470<br>01470<br>01470                                               | BUFON  ;******  BUFOFF  ;*******  LOP1  PTLOOP                                       | LD<br>LD<br>JP<br>****<br>XOR<br>LD<br>JP<br>****<br>LD<br>OR<br>JP<br>LD<br>LD<br>CALL<br>POP<br>CALL<br>POP<br>CALL<br>POP<br>CALL<br>POP<br>TR               | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAR                                                                                                                                                                                                                                                                                |
| 01270<br>01280<br>01290<br>01390<br>01310<br>01320<br>01350<br>01350<br>01350<br>01360<br>01370<br>01380<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490<br>01490    | BUFON  ;******  BUFOFF  ;*******  LOP1  PTLOOP                                       | LD LD JP ****  XOR LD JP JP CD LD                                                                                           | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR BCHAR CC RCV DE,BUFBEG A,UDE BUFBEG BUFBEG A,UDE BUFBEG BUFBEG BUFBEG BUFBEG BUFBEG BUF | :BUFFER OPEN :GO BACK FER OFF *********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ********  :NUMBER OF CHARS IN BUFF :GET MS COUNT MERGE LS :BUFFER EMPTY, GO BACK  :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD  :CNTRL/C?  :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING                                                                                                                                                                                                                                                |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>01350<br>01350<br>01360<br>01370<br>01380<br>0140<br>01420<br>01440<br>01450<br>01460<br>01470<br>01480<br>01490<br>01520                                                  | BUFON  ;******  BUFOFF  ;*******  LOP1  PTLOOP                                       | LD<br>LD<br>JP<br>****<br>XOR<br>LD<br>JP<br>LD<br>OR<br>JR<br>JP<br>LD<br>LD<br>CALL<br>CALL<br>POP<br>CP<br>JR<br>JP<br>LD<br>CALL<br>CALL<br>POP<br>CP<br>LD | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFFA (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE,HL A,H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT                                                                                                                                                                                                                                       |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>01350<br>01350<br>01370<br>0140<br>01440<br>01440<br>01440<br>01470<br>01470<br>01470<br>01470<br>01510<br>01520<br>01530<br>01540                                         | BUFON  ;******  BUFOFF  ;*******  LOP1  PTLOOP                                       | LD LD JP **** XOR LD JP **** LD OR JP LD                                                                                    | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR BCHAR CC RCV DE,BUFBEG A,UDE BUFBEG BUFBEG A,UDE BUFBEG BUFBEG BUFBEG BUFBEG BUFBEG BUF | :BUFFER OPEN :GO BACK FER OFF *********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ********  :NUMBER OF CHARS IN BUFF :GET MS COUNT MERGE LS :BUFFER EMPTY, GO BACK  :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD  :CNTRL/C?  :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING                                                                                                                                                                                                                                                |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01350<br>01350<br>01350<br>01370<br>01370<br>01400<br>01440<br>01450<br>01440<br>01470<br>01480<br>01470<br>01450<br>01450<br>01530<br>01530<br>01530                               | BUFON  ;******  BUFOFF  ;*******  LOP1 PTLOOP                                        | LD LD JP **** XOR LD JP **** LD LD JP LD JR JP LD LD CALL CALL CALL CALL CALL CALL CAL                                                                          | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,FTLOOP RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | :BUFFER OPEN :GO BACK FER OFF *********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :CHECK KEYBOARD :CNIRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAP :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT JERO :DONE                                                                                                                                                                                                   |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01330<br>01350<br>01350<br>01350<br>01360<br>01370<br>01420<br>01420<br>01420<br>01450<br>01460<br>01470<br>01480<br>01520<br>01530<br>01530<br>01540                                        | BUFON  :******  BUFOFF  :********  LOPI PTLOOP  LOP                                  | LD LD JP **** XOR LD JP **** LD LD OR JR JP LD CALL CALL POP CP JR JP INC DEC LD OR JP ****                                                                     | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFER - ERASES BUFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | :BUFFER OPEN :GO BACK TER OFF ********  :BUFFER CLOSED :GO BACK  BUFFER TO PRINTER ******* :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY. GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C?  :STOP PRINT. GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT TERO :BONE :ER **********                                                                                                                                                                          |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01320<br>01350<br>01350<br>01350<br>01370<br>01370<br>01400<br>01440<br>01450<br>01440<br>01470<br>01480<br>01470<br>01450<br>01450<br>01530<br>01530<br>01530                               | BUFON  :******  BUFOFF  :********  LOPI PTLOOP  LOP                                  | LD L                                                                                                                        | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,FTLOOP RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | :BUFFER OPEN :GO BACK FER OFF *********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :CHECK KEYBOARD :CNIRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAP :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT JERO :DONE                                                                                                                                                                                                   |
| 01270<br>01280<br>01290<br>01300<br>01310<br>01350<br>01350<br>01350<br>01350<br>01360<br>01400<br>01420<br>01420<br>01450<br>01470<br>01470<br>01520<br>01550<br>01550<br>01570<br>01590                                                 | BUFON  :******  BUFOFF  :********  LOPI PTLOOP  LOP                                  | LD LD JP **** LD LD JP LD LD OR JP LD                                                                                       | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L. NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFER - ERASES BUFF BUFSET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C/ :STOP PRINT, GO BACK :PT TO NEXT CHAP :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT TERO :DONE FER ************************************                                                                                                                                                  |
| 01270 01280 01290 01300 01310 01330 01340 01350 01350 01360 01370 01380 01400 01420 01440 01450 01470 01480 01470 01520 01530 01530 01540 01570 01580 01580 01570 01580                                                                   | BUFON  ;******  BUFOFF  ;*******  LOP1 PTLOOP  LOP  LOP  ########################    | LD LD JP **** XOR LD JP **** LD LD OR JR LD LD CALL POP CALL CALL POP CALL CALL POP CALL CALL POP CALL CALL POP LD          | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFSET RCV BUFSET RCV HL,Ø (BUFNUM),HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C/ :STOP PRINT, GO BACK :PT TO NEXT CHAP :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT TERO :DONE FER ************************************                                                                                                                                                  |
| 01270 01280 01290 01390 01310 01330 01340 01350 01350 01380 01370 01400 01410 01420 01450 01450 01450 01550 01550 01550 01550 01550 01550 01550 01560 01570 01580 01590 01610                                                             | BUFON  ;******  BUFOFF  ;*******  LOP1 PTLOOP  LOP  LOP  ########################    | LD L                                                                                                                        | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFSET RCV HL,0 (BUFNUM),HL HL,BUFBEG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | :BUFFER OPEN :GO BACK FER OFF *********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PPINT :PRINT LT :CHECK KEYBOARD :CNTRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT JERO :DONE :FER ************* :ERASES BUFFER :DONE :NUMBER OF CHARS SET TO 0                                                                                                                       |
| 01270 01280 01290 01300 01310 01330 01350 01350 01350 01380 01370 01400 01410 01420 01450 01450 01470 01550 01550 01570 01580 01570 01580 01570 01580 01570 01580 01570 01620                                                             | BUFON  ;******  BUFOFF  ;*******  LOP1 PTLOOP  LOP  LOP  ########################    | LD LD JP **** LD LD JP **** LD LD OR JP LD                                                                                  | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFSET RCV BUFSET RCV HL,Ø (BUFNUM),HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :CHECK KEYBOARD :CNIEL/C? :STOP PRINT, GO BACK :PI TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :MERGE LS COUNT :GO IF COUNT NOT JERO :DONE  FER ************** :ERASES BUFFER :DONE                                                                                                                                            |
| 01270 01230 01290 01310 01320 01350 01350 01350 01360 01370 01380 01400 01440 01450 01440 01450 01470 01480 01470 01520 01530 01560 01570 01580 01580 01590 01580 01580 01580 01580 01580 01580 01580 01580 01580 01580 01580 01580 01580 | BUFON  ;******  BUFOFF  ;*******  LOP1 PTLOOP  LOP  LOP  ########################    | LD LD JR LD LD LD CALL CALL CALL LD LD LD CALL LD LD LD CALL CALL                                                                                               | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFER - ERASES BUFF RCV HL,0 (BUFNUM),HL HL,BUFBEG (BUFPTR),HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | :BUFFER OPEN :GO BACK FER OFF *********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PPINT :PRINT LT :CHECK KEYBOARD :CNTRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT JERO :DONE :FER ************* :ERASES BUFFER :DONE :NUMBER OF CHARS SET TO 0                                                                                                                       |
| 01270 01280 01290 01300 01330 01330 01340 01350 01350 01380 01370 01380 01400 01420 01420 01420 01450 01500 01500 01550 01550 01550 01550 01560 01570 01580 01560 01600 01620 01650                                                       | BUFON  ;******  BUFOFF  ;*******  LOP1 PTLOOP  LOP  BUFER  BUFER  BUFSET             | LD LD LD LD LD LD LD CALL CALL POP CP LD LD CR LD LD LD CR LD                                                               | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFER - ERASES BUFF BUFSET RCV HL,0 (BUFNUM),HL HL,BUFBEG (BUFPTR),HL BUFPUT - PUTS CHAR HL,(BUFPTR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | :BUFFER OPEN :GO BACK FER OFF ********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNIRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAP :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT JERO :DONE :RY********* :ERASES BUFFER :DONE :NUMBER OF CHARS SET TO Ø :INITIALIZE BUFF POINTER INTO BUFFER *********                                                                               |
| 01270 01280 01290 01300 01310 01330 01350 01350 01350 01360 01370 01400 01410 01420 01450 01450 01450 01550 01550 01550 01570 01580 01570 01580 01570 01580 01570 01680                                                                   | BUFON  :****** BUFOFF  :*******  LOPI PTLOOP  LOP  :*******  BUFER  BUFSET  :******* | LD L                                                                                                                        | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFSET RCV HL,0 (BUFNUM),HL HL,BUFBEG (BUFPTR),HL BUFPUT - PUTS CHAR HL,(BUFPTR) A,(CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | :BUFFER OPEN :GO BACK FER OFF ********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C7  :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :BO IF COUNT NOT THRO :DONE :REASES BUFFER :DONE :NUMBER OF CHARS SET TO 0 :INITIALIZE BUFF POINTER  INTO BUFFER ********* :MEXT POSITION :GET CHAR |
| 01270 01280 01290 01300 01310 01350 01350 01350 01360 01370 01370 01400 01440 01450 01440 01450 01470 01480 01470 0150 01510 0150 01570 0150 01570 01560 01570 01600 01610 01650 01670                                                    | BUFON  :****** BUFOFF  :*******  LOPI PTLOOP  LOP  :*******  BUFER  BUFSET  :******* | LD LD LD CALL LD L                                                                                                             | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFER - ERASES BUFF BUFSET RCV HL,0 (BUFNUM),HL HL,BUFBEG (BUFPTR),HL BUFPUT - PUTS CHAR HL,(BUFPTR) A,(CHAR) (HL),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******* :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT IT :CHECK KEYBOARD :CNTRL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT SERO :DONE :ERASES BUFFER :DONE :NUMBER OF CHARS SET TO Ø :INITIALIZE BUFF POINTER  INTO BUFFER ******** :NEXT POSITION :GET CHAR :PUT CHAR IN BUFFER                                                                          |
| 01270 01280 01290 01300 01310 01330 01350 01350 01350 01360 01370 01400 01410 01420 01450 01450 01450 01550 01550 01550 01570 01580 01570 01580 01570 01580 01570 01680                                                                   | BUFON  :****** BUFOFF  :*******  LOPI PTLOOP  LOP  :*******  BUFER  BUFSET  :******* | LD L                                                                                                                        | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFSET RCV HL,0 (BUFNUM),HL HL,BUFBEG (BUFPTR),HL BUFPUT - PUTS CHAR HL,(BUFPTR) A,(CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | :BUFFER OPEN :GO BACK FER OFF ********  :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******** :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTRL/C7  :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :BO IF COUNT NOT THRO :DONE :REASES BUFFER :DONE :NUMBER OF CHARS SET TO 0 :INITIALIZE BUFF POINTER  INTO BUFFER ********* :MEXT POSITION :GET CHAR |
| 01270 01280 01290 01300 01310 01330 01340 01350 01360 01370 01380 01400 01420 01420 01450 01440 01450 01450 01570 01550 01570 01560 01570 01660 01670 01680                                                                               | BUFON  :****** BUFOFF  :*******  LOPI PTLOOP  LOP  :*******  BUFER  BUFSET  :******* | LD L                                                                                                                        | A,1 (BUFLAG),A RCV BUFOFF - TURNS BUFF A (BUFLAG),A RCV BUFPR - DUMPS FROM HL,(BUFNUM) A,H L NZ,LOP1 RCV DE,BUFBEG A,(DE) DE PRCHAR KBCHAR DE 3 NZ,LOP RCV DE HL A,H L NZ,PTLOOP RCV BUFER - ERASES BUFF BUFSET RCV HL,0 (BUFNUM),HL HL,BUFBEG (BUFPTR),HL BUFPUT - PUTS CHAR HL,(BUFPTR) A,(CHAR) (HL),A HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | :BUFFER OPEN :GO BACK FER OFF ******** :BUFFER CLOSED :GO BACK BUFFER TO PRINTER ******* :NUMBER OF CHARS IN BUFF :GET MS COUNT :MERGE LS :BUFFER EMPTY, GO BACK :FIRST BUFFER CHAR :CHAR TO PRINT :PRINT LT :CHECK KEYBOARD :CNTEL/C? :STOP PRINT, GO BACK :PT TO NEXT CHAR :NUMBER OF CHARS REMAINING :GET MS COUNT :MERGE LS COUNT :GO IF COUNT NOT SERO :DONE FER ********* :ERASES BUFFER :DONE :NUMBER OF CHARS SET TO 0 :INITIALIZE BUFF POINTER  INTO BUFFER ******* :GET CHAR :PUT CHAR IN BUFFER :INC BUFFTR                                       |

#### Listing 1 continued: Ø171Ø TNC Н : ADD | L 01720 LD (BUFNUM), HL ;STORE IT 01730 RET DISKRD --READ A FILE FROM DISK \*\*\*\*\*\*\*\*\* FILNAM ;SETS UP DCB B,0 ;LRL SET TO 256 01740 ¥.¥.¥.¥ 01750 DISKRD CALL 01760 LD DE, DCB FIST ADDR OF DOB 01770 LD :1ST ADDR OF DISK BUFFER 01780 LD HL, BUFFER 01790 CALL OPEN ; OPENS SPECIFIED FILE 01800 CALL RESTOR ; RESTORE SCREEN 01810 LD A, (ERNM) IMSB OF ERN 01820 LD H, A :MSB OF ERN IN H ;LSB OF ERN 01830 LDA, (ERNL) 01840 ;LSB OF ERN IN LD (CTRD),HL 01850 ## OF RECORDS TO READ LD01860 DEC ;LSB-1 OF ERN 01870 ÓR ;ERN = 1 ?01880 JR Z,RDRC3 ; IF SO, GO GETTING READY TO READ 01890 RDRC LDDE, DCB MOVE RECORD TO DBUFF 1ST DBUFFER ADDR 01900 CALL READ 01910 LD HL, BUFFER 01920 DE, (BUFPTR) ;DESTINATION LD 01930 LD B.C. 100H ;256 BYTES TO MOVE 01940 POP RESTORE A AF 01950 CTRL / F2 CP PUSH AF SAVE A 01960 Ø197Ø ĴŔ NZ, LDBUF MOVE BYTES TO BUFFER ดาจอด CALL FAST SEND TO COMPUTER 01990 GETMR ĴR ; CONTINUE 02000 LDBUF LDIR MOVE BYTES TO BUFFER 02010 ΙD (BUFPTR) DF SAVE NEW BUFFER POINTER 02020 HL; (BUFNUM) NEED TO UPDATE BUFNUM I D ;ADD 256 TO HL 02030 INC 02040 LD (BUENUM) HI ;SAVE # CHAR ; PREVIOUS # RECORDS 02050 GETMR I D HL, (CTRD) 02060 DEC ΗΙ ; CURRENT # RECORDS 02070 ΙD (CTRD), HL ; SAVE IT ; CHECK IF (CTRD) IS 1 DEC 02080 HI 02090 LD A, L ;LSB 02100 OR ; MERGE MSB 02110 ĴR NZ, RDRC ; IF (CTRD)>1, READ NEXT RECORD ;1 RECORD LEFT 02120 RDRC3 LD DE, DCB ;PUT IT IN DBUFFER ;EOF OF LAST RECORD 02130 READ CALL A, (EOF) 02140 L.D 02150 СP ;FULL 256 BYTES ? ; IF NOT, GO 02160 JR NZ, RDRC1 02170 LD DE, (BUFPTR) ; DISTINATION 02180 HL, BUFFER LD ; SOURCE 02190 LD BC,100H ;# OF BYTES TO MOVE 02200 POP AF ; RESTORE A 02210 СP 6 ;CTRL/F ? 22220 PUSH ;SAVE A ; PUT INTO BUFF 02230 ĴR NZ,LDBUF1 0:2240 CALL SEND TO COMPUTER FAST 02250 GT. RDRC2 ; DONE MOVE 'EM 02260 LDBUF1 LDIR 02270 LD(BUFPTR), DE SAVE BUFFER POINTER ;UP DATE BUFNUM ;ADD 256 TO HL 22280 02290 LDHL; (BUFNUM) INC Н 22300 LD (BUFNUM), HL ;SAVE # OF CHAR IN BUFFER 02310 JR ;FINISHED READING FILE RDRC2 32320 RDRC1 A<sub>1</sub> (EOF) I D # BYTES TO MOVE 02330 LD Cr A # BYTES TO MOVE IN BC 2:2340 02350 LD POP B,0 AF 02360 CP ;CTRL/F? 6 02370 PUSH AF ;SAVE A ; IF CTRL/F GO 02380 J.R. 7 . RD 02390 LDHL, (BUFNUM) ;PREVIOUS # IN BUFF 02400 ADD HL, BC ;UPDATE IT 02410 LD(BUFNUM), HL ; SAVE BUFNUM 02420 LJD DE, (BUFPTR) \*DESTINATION 0/24/30 RD LD HL, BUFFER SOURCE AF 0.2440 POP \*RESTORE A 02450 CP #CTRL/F ? PUSH 02460 AF-SAVE A

02470

02480

02490

02510

02520

02530

02540

02550

02560

02570

02580

02500 LDBUF2

RDRC2

BUFXMT

JR

TR.

LD

LD

JP.

Li

L D

OR

CALL

LDIR

CALL

NZ:LDBUF2

(BUFPTR), DE

BC, (BUFNUM)

FAST

RDRC2

DE, DCB

CLOSE

RCV

A,B

Listing 1 continued on page 462

\*\*\*\*\*\*

FPUT INTO BUFF

; DONE

BUFXMT - DUMPS FROM BUFFER TO COMPUTER

# MSB

; CLOSE IT

MERGE LSB

;SEND TO COMPUTER

; MOVE BYTES INTO BUFF

; READY TO CLOSE FILE

; FINISHED, GO BACK

# CHAR IN BUFFER

; SAVE NEW BUFF POINTER



Circle 466 on Inquiry card.



 16K RAM upgradable to 64K.

• With OSA+

Version 4 is double density.

- Runs standard 5¼" or 8" drives.
- A Z80 4 MHz controller.
- A serial and a parallel port.
- Software compatible with existing ATARI software.
- Is CP/M compatible (with 64K).

ATR8000 \$499.95 OSA+ Version 4 \$49.95 5¼" drive \$399.95 64K Upgrade — Call—

SOFTWARE PUBLISHERS, INC. 2500 E. Randol Mill Rd., Suite 125 Arlington, TX 76011 (817) 469-1181

Circle 467 on inquiry card.



#### IRM PC Software

SOFISPOOL (tm)—printer spooler

\*Creates true foreground/background operation

\*Buffer sizes user modifiable (1-128K)

\*Program execution no longer linked to printer speed.

\$49.95 (includes disk & doc) KEYSWAP<sup>(tm)</sup>—typing utility

\*Transforms the PC's keyboard into a standard typewriter keyboard

writer keyboard
"Poorly positioned keys are relocated and replaced
"Optional audible feedback on "toggle" keys
"Increases "touch typist" efficiency
"\$69.95 (includes disk, stick-on labels & doc)

#### **BOTH PROGRAMS**

\*Work with any program that runs under DOS (EASYWRITER (tm), VISICALC (tm), WORDSTAR (tm),

\*Ideal for Business or Software development

PROCRYPT<sup>(tm)</sup>—software protection program \*Encrypts, serializes, and copy protects your program
Call for price!

SOFTSPOOL & KEYSWAP for \$99.95

FOR ORDERS OR INFO CALL—(617) 662-0856

OR SEND CHECK TO: Rickerdata P.O. Box 288 Burlington, MA 01803

MC & VISA accepted Add \$2.50 S&H

rms & conditions may change w/o notice

Circle 370 on inquiry card.

## **MEMOREX FLEXIBLE DISCS**

WE WILL NOT BE UNDER-SOLD!! Call Free (800)235-4137 for prices and information. Dealer inquiries invited and C.O.D.'s accepted



Circle 318 on inquiry card.

## DISKETTES 3M Scotch BRAND

#### AT SUPER LOW PRICES

WE WILL SHIP YOUR **ORDER WITHIN 24 HOURS** AND WE PAY THE SHIPPING CHARGES



VISA WASHINGTON COD ACCEPTED

**DEALER INQUIRIES INVITED** 



**CALL TOLL FREE** 800 922-8193

IN CALIFORNIA 800 468-1068



#### Listing 1 continued:

| 02590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | qr,                                                                                                                  | Z+RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | BUFFER EMPTY, GO BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 02600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | LD                                                                                                                   | HL, BUFBEG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | :1ST BUFFER ADDR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 02610                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | XMTL.P                        | L.D<br>L.D                                                                                                           | A+(HL)<br>(CHAR)+A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CHAR TO BE SENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 02630                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | CP CP                                                                                                                | Ø OCIMICA SM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ;SAVE THE CHAR<br>;ABCII 0 ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 02640                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | JR                                                                                                                   | Z+TEMP3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SIF SON SKIP IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 0.2650                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | GP                                                                                                                   | 141                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | GRAPHIC CR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 02660<br>02670                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                               | JR<br>LD                                                                                                             | NZ+0K1<br>A+13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ; IF NOT IGNORE<br>; CHANGE TO OR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 02680                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | OK1                           | LD                                                                                                                   | (CHAR);A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SAVE CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 02:690                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | LD                                                                                                                   | (XMTBYT) • A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | FPUT CHAR IN XMT BUF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SENDIT                        | CALL                                                                                                                 | RSTX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | :SEND IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 02710<br>02720                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                               | JR<br>CP                                                                                                             | Z,SENDIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ;WAIT UNTIL SENT<br>;CARRIAGE RETURN?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 0:2730                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | JR                                                                                                                   | Z, TEMP3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ; (F SO, 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 02740                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | LD                                                                                                                   | A, (DUPLEX)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | DUPLEX FLAG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 02750<br>02760                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                               | OP<br>JR                                                                                                             | Ø<br>NZ • TEMP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | HALF DUPLEX ?<br>SIF FULL DUP, GO RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 0:2770                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | CALL                                                                                                                 | VIDEO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TI FOLL DOIS NO NOV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 0:2780                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | JR                                                                                                                   | TEMP3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SKIP RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 02790                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TEMP                          | CALL.                                                                                                                | RSRCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CHECK RS 232 RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 02800<br>02810                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                               | LD<br>CP                                                                                                             | A <sub>3</sub> (RCVBYT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ;ANYTHING THERE?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 02820                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | JR                                                                                                                   | Z - TEMP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ; IF NOT, LOOK AGAIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 02830                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | L.D                                                                                                                  | (CHAR)+A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SAVE CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 02840                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 7000 6400                     | CALL                                                                                                                 | AIDEO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRINT CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Ø:285Ø                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | TEMP3                         | DEC<br>LD                                                                                                            | BC<br>A <sub>2</sub> B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ;DECREASE BUFF COUNT<br>;TEST FOR Ø COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 02870                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | OR                                                                                                                   | C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7 ( CCC )   1 SOLY   10   17 ( P.M.)   1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 0:2880                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | JP                                                                                                                   | Z, RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ;ALL DONE: 50 BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 02890<br>02900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                               | INC<br>LD                                                                                                            | HL -<br>Ax(CHAR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ;INCREASE CHAR LOCATION<br>;GET CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 02910                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | CP                                                                                                                   | 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ;CARRIAGE RETURN 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 02920                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | JR                                                                                                                   | NZ+XMTLP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ; IF NOT. GO GET NEXT CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 0:2930                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | LD                                                                                                                   | A* (HL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | NEXT CHAR IN BUFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 02940<br>02950                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                               | CP<br>JR                                                                                                             | Ø<br>NZ,PAUSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | :IS IT A 0 7<br>:IF NOT, GO PAUSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 02960                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | LD                                                                                                                   | A, C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TEST IF LAST CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 02970                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | DEC                                                                                                                  | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7 Tank 27 Av Karl Pac I Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 02980                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | OR                                                                                                                   | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | and the contract of the contract of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 02990<br>03000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | PAUSE                         | JP<br>CALL                                                                                                           | Z,RCV<br>RSRCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ;LAST CHAR 0, SO DONE<br>;CHECK FOR INCOMING CHARS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | I HOUL                        | LD                                                                                                                   | A+ (RCVBYT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | GET CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 03020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | CP                                                                                                                   | Ø                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ;ANYTHING THERE ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03030                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | 1(0)                                                                                                                 | 7 DALL4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               | JR                                                                                                                   | Z+PAU1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03040                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                               | CP                                                                                                                   | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SLINE FEED ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03040<br>03050<br>03060<br>03070                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                               | CP<br>JR<br>LD<br>CALL                                                                                               | 10<br>Z,PAUSE<br>(CHAR),A<br>VIDEO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ;LINE FEED ?<br>;IF SO, IGNORE IT<br>;SAVE CHAR<br>;PRINT RECEIVED CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 03040<br>03050<br>03060<br>03060<br>03070<br>03080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                               | CP<br>JR<br>LD<br>CALL<br>JR                                                                                         | 10<br>Z,PAUSE<br>(CHAR),A<br>VIDEO<br>PAUSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | :LINE FEED ?<br>:IF SO: IGNORE IT<br>:SAVE CHAR<br>:PRINT RECEIVED CHAR<br>:GO CHECK RS232 RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03040<br>03050<br>03060<br>03070<br>03080<br>03090                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PAU1                          | CP<br>JR<br>LD<br>CALL                                                                                               | 10<br>Z,PAUSE<br>(CHAR),A<br>VIDEO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SLINE FEED ?<br>SIF SO, IGNORE IT<br>SAVE CHAR<br>PRINT RECEIVED CHAR<br>GO CHECK RS232 RCV<br>CHECK KEYBOARD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 03040<br>03050<br>03060<br>03060<br>03070<br>03080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PAU1                          | CP<br>JR<br>LD<br>CALL<br>JR<br>CALL                                                                                 | 10<br>Z.PAUSE<br>(CHAR),A<br>VIDEO<br>PAUSE<br>KBCHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | :LINE FEED ?<br>:IF SO: IGNORE IT<br>:SAVE CHAR<br>:PRINT RECEIVED CHAR<br>:GO CHECK RS232 RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03040<br>03050<br>03060<br>03060<br>03080<br>03090<br>03100<br>03110<br>03120                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PAU1                          | CP<br>JR<br>LD<br>CALL<br>JR<br>CALL<br>CP<br>JR<br>CP                                                               | 10<br>Z:PAUSE<br>(CHAR);A<br>VIDEO<br>PAUSE<br>KECHAR<br>0<br>Z:PAUSE<br>3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT: GO CHECK RS RCV CTRL/C ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03040<br>03050<br>03060<br>03060<br>03080<br>03090<br>03100<br>03110<br>03120<br>03130                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               | CP<br>JR<br>LD<br>CALL<br>JR<br>CALL<br>CP<br>JR<br>CP<br>JP                                                         | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ.XMTLP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD SANYTHING THERE ? SIF NOT, GO CHECK RS RCV COTTON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 03040<br>03050<br>03060<br>03060<br>03080<br>03090<br>03100<br>03110<br>03120<br>03130                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | PAU1<br>TEMP2                 | CP<br>JR<br>LD<br>CALL<br>JR<br>CALL<br>CP<br>JR<br>CP                                                               | 10<br>Z:PAUSE<br>(CHAR);A<br>VIDEO<br>PAUSE<br>KECHAR<br>0<br>Z:PAUSE<br>3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 03040<br>03050<br>03060<br>03080<br>03080<br>03190<br>03112<br>03112<br>03130<br>03140<br>03150<br>03160                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TEMP2                         | CP<br>JR<br>LD<br>CALL<br>JR<br>CALL<br>CP<br>JP<br>CP JP<br>PUSH<br>PUSH<br>JP                                      | 10 Z:PAUSE (CHAR);A VIDEO PAUSE KECHAR 0 Z:PAUSE 3 NZ:XMTLP HL EC RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT: GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 03040<br>03050<br>03060<br>03080<br>03080<br>03110<br>03110<br>03130<br>03150<br>03150<br>03150<br>03170                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TEMP2                         | CP<br>JR<br>LD<br>CALL<br>JR<br>CALL<br>CP<br>JP<br>JP<br>PUSH<br>PUSH<br>JP<br>POP                                  | 10 Z:PAUSE (CHAR);A VIDEO PAUSE KBCHAR 0 Z:PAUSE 3 NZ:XMTLP HL BC RCV BC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? IF NOT, GO CHECK RS RCV CTRL/C ? SO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 03040<br>03050<br>03060<br>03060<br>03060<br>03100<br>03110<br>03120<br>03140<br>03150<br>03160<br>03160<br>03160                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TEMP2<br>PAU2                 | CP JR LD CALL JR CALL CP JR CALL CP JR COP JR PUSH PUSH JP POP POP                                                   | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK R5232 RCV CHECK KEYBOARD SANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03120<br>03130<br>03150<br>03150<br>03160<br>03150<br>03150<br>03150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR CALL CP JR CP JP PUSH PUSH JP POP POP JR                                                 | 10 Z:PAUSE (CHAR);A VIDEO PAUSE KBCHAR 0 Z:PAUSE 3 NZ:XMTLP HL BC RCV BC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03120<br>03150<br>03150<br>03160<br>03170<br>03170<br>03170<br>03180<br>03190<br>03200<br>03200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TEMP2 PAU2 BACK               | CP JR LD CALL JR CALL GP JR CP JP PUSH PUSH PUSH POP POP JR LD                                                       | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP SKSV - DUMP BUFFF BC,(BUFNUM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD SANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS RT O DISK ************************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03150<br>03150<br>03160<br>03170<br>03160<br>03170<br>03160<br>03160<br>03160<br>03160                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR CALL CP JP PUSH PUSH JP POP POP JR LD LD                                                 | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP SKSV - DUMP BUFFI BC,(BUFNUM) A,C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS :FO SEND MORE CHARS :FO SEND MORE CHARS :# CHARS IN BUFFER :# CHARS IN BUFFER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03120<br>03150<br>03150<br>03160<br>03170<br>03170<br>03170<br>03180<br>03190<br>03200<br>03200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL GP JR CP JP PUSH PUSH PUSH POP POP JR LD                                                       | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP SKSV - DUMP BUFFF BC,(BUFNUM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD SANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS RT O DISK ************************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03150<br>03150<br>03170<br>03170<br>03170<br>03220<br>033230<br>033230                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | TEMP2 PAU2 BACK ;******       | CP JR LD JR CALL JR CALL CP JR CP JP PUSH PUSH JP POP POP JR **** DIS LD LD OR                                       | 10 Z.PAUSE (CHAR), A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP SKSV - DUMP BUFFF BC, (BUFNUM) A, C B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE RUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS ER TO DISK ******** :# CHARS IN BUFFER :LSB :MERGE MSB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03150<br>03150<br>03160<br>03170<br>03160<br>03160<br>03170<br>03160<br>03170<br>03220<br>03220<br>03220<br>03220<br>03220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR CP JP PUSH PUSH JP POP JR LD LD CALL LD CALL LD                                          | 10 Z:PAUSE (CHAR);A VIDEO PAUSE KBCHAR 0 Z:PAUSE 3 NZ:XMTLP HL BC RCV BC HL XMTLP BCSKSV - DUMP BUFFI BC:(BUFNUM) A:C B Z:RCV FILNAM HL:BUFFER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV GO SEND MORE CHARS TO DISK ********  ### CHARS IN BUFFER LSB MERGE MSB BUFFER EMPTY SETS UP DCB DBUFF ADDRESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03120<br>03150<br>03160<br>03160<br>03160<br>03160<br>03170<br>03170<br>03120<br>03200<br>03220<br>03220<br>03220<br>033230                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL GP JP PUSH PUSH POP POP JP LD LD GR JP CALL                                                    | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BKSV - DUMP BUFFF BC,(BUFNUM) A,C B Z.RCV FILNAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR FOR THE SON TOWNER FOR THE SON TOWNER GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS ER TO DISK ********* # CHARS IN BUFFER SLSB SBUFFER EMPTY SETS UP DCB SDBUFF ADDRESS SDCB ADDRESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03120<br>03150<br>03160<br>03160<br>03160<br>03170<br>03180<br>03190<br>0320<br>0320<br>03220<br>03230<br>03230<br>03250<br>03250<br>03250<br>03250                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JP PUSH PUSH JP POP JR LD                               | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB E,0 E,0 ENTER | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD SANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS ER TO DISK ******* S# CHARS IN BUFFER LSB MERGE MSB SBUFFER EMPTY SETS UP DCB DBUFF ADDRESS LCR ADDRESS LCR ADDRESS LCR ST TO 256 OPENS FILE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 03040<br>03050<br>03060<br>03090<br>03100<br>03110<br>03150<br>03150<br>03150<br>03160<br>03170<br>03160<br>03160<br>03170<br>0320<br>03210<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR CALL CP JP PUSH PUSH JP POP JR **** DIS LD           | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BCSKSV - DUMP BUFFI BC,(BUFNUM) A,C B Z.RCV FILNAM HL.BUFFER DE,DCB B,0 INIT HL,(BUFNUM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV GO SEND MORE CHARS TO DISK ********* SHORE MSB MERGE MSB MERGE MSB SBUFFER EMPTY SETS UP DCB DBUFF ADDRESS LDCB ADDRESS LOPENS FILE SH CHARS TO WRITE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 03040<br>03050<br>03060<br>03090<br>03090<br>03100<br>03110<br>03150<br>03150<br>03170<br>03170<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03230<br>03230<br>03230                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR CALL CP JP PUSH PUSH JP POP JR **** DIS LD LD CALL LD L | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB E,0 E,0 ENTER | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK R5232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS ER TO DISK ******** :# CHARS IN BUFFER :LSB :MERGE MSB :BUFFER ENPTY :SETS UP DCB :DBUFF ADDRESS :LML SET TO 256 :OPENS FILE :# CHARS TO WRITE :EOF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 03040<br>03050<br>03060<br>03090<br>03100<br>03110<br>03150<br>03150<br>03150<br>03160<br>03170<br>03160<br>03160<br>03170<br>0320<br>03210<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR CALL CP JP PUSH PUSH JP POP JR **** DIS LD           | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB E.0 INIT HL.(BUFNUM) A,L (EOF),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR PRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV GO SEND MORE CHARS TO DISK ********* SHORE MSB MERGE MSB MERGE MSB SBUFFER EMPTY SETS UP DCB DBUFF ADDRESS LDCB ADDRESS LOPENS FILE SH CHARS TO WRITE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03150<br>03150<br>03160<br>03170<br>03160<br>03160<br>03170<br>03180<br>03220<br>03220<br>03220<br>03220<br>03220<br>032300<br>032300<br>033310<br>033310<br>033310<br>033310                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL JR CALL CP JR CP JP PUSH PUSH JP POP JR LD                 | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC.(BUFNUM) A.C B Z.RCV FILNAM HL.BUFFER DE.DCB B.0 INIT HL.(BUFNUM) A.L (EOF).A 0 Z.OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS ER TO DISK ******** :# CHARS IN BUFFER :LSB :MERGE MSB :BUFFER ENPTY :SETS UP DCB :DBUFF ADDRESS :DCR ADDRESS :LML SET TO 256 :OPENS FULE :# CHARS TO WRITE :EOF :SAVE IT :EOF :SAVE IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 03040<br>03050<br>03060<br>03090<br>03100<br>031100<br>03130<br>03150<br>03150<br>03160<br>03170<br>03180<br>03170<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03230<br>03240<br>03220<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TEMP2 PAU2 BACK ;******       | CP JR LD CALL JR CALL CP JR COP JP PUSH PUSH JP POP JR LD                        | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL.BUFFER DE,DCB B:0 INIT HL.(BUFNUM) A,L (EOF),A 0 Z.OK A,H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS ER TO DISK ******** :# CHARS IN BUFFER :LSB :MERGE MSB :BUFFER EMPTY :SETS UP DCB :DBUFF ADDRESS :LML SET TO 256 :OPENS FILE :# CHARS TO WRITE :EOF :BACK IT :EOF = U? :(CTRD) IS OK :MUST INCREMENT (CTRD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 03040<br>03050<br>03060<br>03070<br>03090<br>03100<br>03110<br>03150<br>03150<br>03160<br>03170<br>03160<br>03160<br>03170<br>03180<br>03220<br>03220<br>03220<br>03220<br>03220<br>032300<br>032300<br>033310<br>033310<br>033310<br>033310                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TEMP2 PAU2 BACK ;***** DISKSV | CP JR LD CALL JR CALL JR CALL CP JR CP JP PUSH PUSH JP POP JR LD                 | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC.(BUFNUM) A.C B Z.RCV FILNAM HL.BUFFER DE.DCB B.0 INIT HL.(BUFNUM) A.L (EOF).A 0 Z.OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS ER TO DISK ******** :# CHARS IN BUFFER :LSB :MERGE MSB :BUFFER ENPTY :SETS UP DCB :DBUFF ADDRESS :DCR ADDRESS :LML SET TO 256 :OPENS FULE :# CHARS TO WRITE :EOF :SAVE IT :EOF :SAVE IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 03040<br>03050<br>03060<br>03090<br>03100<br>031100<br>03150<br>03150<br>03150<br>03160<br>03160<br>03160<br>03160<br>03160<br>03170<br>03180<br>0320<br>03220<br>03220<br>03220<br>03230<br>03230<br>03230<br>03230<br>03230<br>03330<br>03330<br>03340<br>03330<br>03340<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TEMP2 PAU2 BACK ;***** DISKSV | CP JR LD CALL JR CALL JR CALL CP JR CP JP PUSH PUSH PUSH JP POP JR LD            | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BCSKSV - DUMP BUFFF BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB E,0 INIT HL.(BUFNUM) A3L (EOF),A 0 Z.OK A,H A (CTRD),A (ERNL),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV :GO SEND MORE CHARS ER TO DISK ******* :# CHARS IN BUFFER :LSB :MERGE MSB :BUFFER ENPTY :SETS UP DCB :DBUFF ADDRESS :DCB ADDRESS :LML SET TO 256 :OPENS FILE :# CHARS TO WRITE :EOF :SAVE IF :EOF :SAVE IF :EOF :SAVE IF :EOF :CTRD) IS OK :MUST INCREMENT (CTRD) :A CONTAINS # RECORDS :# RECORDS TO WRITE :LSB ERN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03040<br>03050<br>03060<br>03090<br>03100<br>031100<br>03130<br>03150<br>03150<br>03160<br>03160<br>03170<br>03180<br>03210<br>03220<br>03220<br>03220<br>03220<br>03220<br>03230<br>03240<br>03220<br>03260<br>03260<br>03260<br>03260<br>03360<br>03360<br>03360<br>03360<br>03360<br>03360<br>03360<br>03360                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TEMP2 PAU2 BACK ;***** DISKSV | CP JR LD CALL JR CALL CP JR CALL CP JP PUSH PUSH JP POP POP JR **** DIS LD       | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL.BUFFER DE,DCB B:0 HNIT HL.(BUFNUM) AsL (EOF):A 0 Z.OK A,H A (CTRD):A A A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR SOO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS ER TO DISK ********* # CHARS IN BUFFER SLSB SBUFFER EMPTY SETS UP DCB DBUFF ADDRESS DCB ADDRESS LOB SET TO 256 COPENS FILE # CHARS TO WRITE SEOF SAVE IT SEOF # U? (CTRD) IS OK MUST INCREMENT (CTRD) A LONFAINS # RECORDS # RECORDS TO WRITE LSB ERN SZERO A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03.040<br>03.050<br>03.050<br>03.060<br>03.090<br>03.100<br>03.120<br>03.130<br>03.140<br>03.150<br>03.150<br>03.150<br>03.200<br>03.200<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.220<br>03.230<br>03.230<br>03.230<br>03.230<br>03.230<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.330<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.300<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03.000<br>03                                                                                                                                                                                  | TEMP2 PAU2 BACK ;***** DISKSV | CP JR LD CALL JR CALL GP JP PUSH PUSH JP POP POP ST LD                           | 10 Z.PAUSE (CHAR),A VIDEO PAUSE RECHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB B,0 INIT HE,(BUFNUM) A,L (EOF),A 0 CTOOK A,H A (ERNIL),A A (ERNIL),A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR SPRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS ER TO DISK ******** # CHARS IN BUFFER SLSB MERGE MSB SBUFFER ENPTY SETS UP DCB DBUFF ADDRESS LOR ADDRESS LOR ADDRESS LOR ADDRESS LOR ADDRESS SOPENS FILE # CHARS TO WRITE SEOF SAVE IT SEOF # U? SAVE IT SAV |
| 03040<br>03050<br>03060<br>03090<br>03100<br>03110<br>03120<br>03150<br>03150<br>03160<br>03160<br>03160<br>03170<br>03160<br>03200<br>03220<br>03220<br>03220<br>03220<br>03220<br>03231<br>03330<br>03340<br>03330<br>03340<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03330<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03340<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>03440<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0340<br>0                         | TEMP2 PAU2 BACK ;***** DISKSV | CP JR LD CALL JR CALL CP JR CALL CP JP PUSH PUSH JP POP POP JR **** DIS LD       | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL.BUFFER DE,DCB B:0 HNIT HL.(BUFNUM) AsL (EOF):A 0 Z.OK A,H A (CTRD):A A A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR SOO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS ER TO DISK ********* # CHARS IN BUFFER SLSB SBUFFER EMPTY SETS UP DCB DBUFF ADDRESS DCB ADDRESS LOB SET TO 256 COPENS FILE # CHARS TO WRITE SEOF SAVE IT SEOF # U? (CTRD) IS OK MUST INCREMENT (CTRD) A LONFAINS # RECORDS # RECORDS TO WRITE LSB ERN SZERO A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03040<br>03050<br>03060<br>03070<br>03100<br>031100<br>03150<br>03150<br>03160<br>03170<br>03160<br>03170<br>03220<br>03220<br>03220<br>03220<br>03220<br>03220<br>03230<br>03240<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03250<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>03350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>0350<br>035 | TEMP2 PAU2 BACK ;***** DISKSV | CP JR LD CALL JP CALL CP JR COP JP PUSH PUSH JP POP JR LD                        | 10 Z.PAUSE (CHAR),A VIDEO PAUSE RBCHAR 0 Z.PAUSE 3 NZ,XMTLP HL BC RCV BC HL XMTLP BKSV - DUMP BUFFF BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB B,0 INIT HL,(BUFNUM) A,L (ECF),A 0 Z.OK A,H A (CTRD),A (ERNN),A HL,BUFEEG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SLINE FEED ? SIF SO, IGNORE IT SAVE CHAR SON IGNORE IT SAVE CHAR FRINT RECEIVED CHAR GO CHECK RS232 RCV CHECK KEYBOARD ANYTHING THERE ? SIF NOT, GO CHECK RS RCV CTRL/C ? GO SEND MORE CHARS SAVE CURRENT BUFF LOC SAVE BUFF COUNT GO TO RCV BACK FROM RCV  GO SEND MORE CHARS ER TO DISK ********* # CHARS IN BUFFER SLSB MERGE MSB BUFFER EMPTY SETS UP DCB DBUFF ADDRESS DCB ADDRESS LOB ADDRESS LOPENS FILE # CHARS TO WRITE SEOF SAVE IT SEOF # U? (CTRD) IS OK MUST INCREMENT (CTRD) A CONTAINS # RECORDS # RECORDS TO WRITE LSB ERN SOURCE # BYTES TO MOVE SDESTINATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03040<br>03050<br>03060<br>03090<br>03100<br>031100<br>03150<br>03150<br>03150<br>03160<br>03160<br>03160<br>03160<br>03160<br>03160<br>0320<br>03220<br>03220<br>03220<br>032310<br>032310<br>03250<br>03250<br>03260<br>03270<br>03360<br>03370<br>03360<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370<br>03370                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TEMP2 PAU2 BACK ;***** DISKSV | CP JR CALL JR CALL JR CALL CP JR CP JP PUSH PUSH PUSH JP POP JR LD               | 10 Z.PAUSE (CHAR),A VIDEO PAUSE KBCHAR 0 Z.PAUSE 3 NZ,YMTLP HL BC RCV BC HL XMTLP BC,(BUFNUM) A,C B Z.RCV FILNAM HL,BUFFER DE,DCB E,0 INIT HL.(BUFNUM) A,L (EOF),A 0 Z.OK A,H A (ERNIL),A A (ERNIL),A HL,BUFEEG BC,256                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SLINE FEED ? :IF SO, IGNORE IT :SAVE CHAR :PRINT RECEIVED CHAR :GO CHECK RS232 RCV :CHECK KEYBOARD :ANYTHING THERE ? :IF NOT, GO CHECK RS RCV :CTRL/C ? :GO SEND MORE CHARS :SAVE CURRENT BUFF LOC :SAVE BUFF COUNT :GO TO RCV :BACK FROM RCV  :GO SEND MORE CHARS :ER TO DISK ******* :# CHARS IN BUFFER :LSB :MERGE MSB :BUFFER EMPTY :SETS UP DCB :DBUFF ADDRESS :DCR ADDRESS :LML SET TO 256 :OPENS FILE :# CHARS TO WRITE :EOF :SAVE IT :EOF # U? :(CTRD) IS OK :MUST INCREMENT (CTRD) :A CONTAINS # RECORDS :# RECORDS TO WRITE :LSB ERN :ZERO A :MSB ERN :SOURCE :# BYTES TO MOVE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

#### Listing 1 continued:

| Listing          | 1 continue       | d:          |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|------------------|-------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 03460            |                  | CALL        | GRITE.                            | SURITE TO DISK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03470            |                  | LD          |                                   | RECORD COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 03480            |                  | DEC         |                                   | :# RECORDS LEFT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03490<br>03500   |                  | L.D<br>OR   |                                   | MSB<br>MERGE LISB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03510            |                  | JR          |                                   | :IF DOME: GO CLOSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03520            |                  | LD          |                                   | SAVE RECORD COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03530            |                  | JR          | WDISK                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03540<br>03550   | FINWRT           | LD<br>CALL  |                                   | :DCE ADDRESS<br>:CLOSE FILE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 03560            |                  | CALL        |                                   | RESTORE SCREEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03570            |                  | JP          | RCV                               | DONE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                  |                  |             | FILNAM - SETS UP FI               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03590<br>03600   | FILNAM           | L.D         |                                   | *SOURCE<br>*# SCREEN BYLES TO SAVE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03510            |                  | LD          |                                   | DESTINATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 03620            |                  | LDIR        |                                   | SAVE LAST 2 LINES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 03630<br>03640   |                  | LD<br>LD    | A+64                              | A CONT. A CONT. AND AND THE A DESIGNATION OF THE PARTY OF |
|                  | LINE1            | LD          | IX,1625 <b>6</b><br>(IX+Ø),CURSOR | SIST ADDR OF TITH LINE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 03660            |                  | LD          | (IX+64),32                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 0.3570           |                  | INC         | IX                                | CLEARS LAST LINE<br>INC PRINT POSITIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 03480<br>03490   |                  | DEIC<br>J'R | A<br>NZ:LINE1                     | FINISH LINE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 03700            |                  | LD          | HLILINE                           | ;PRINT 'ENTER FILENAME'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 03710            |                  | LD          | B • 14                            | NUMBER OF CHARS TO PRINT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 03720            |                  | LD          |                                   | :1ST PRINT LOCATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 03740            | MESS             | L.D<br>L.D  |                                   | ; PUT CHAR IN A<br>; PRINT IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 0375.0           |                  | INC         |                                   | ;INC MESSAGE POINTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 03760            |                  | INC         |                                   | FINC PRINT LOCATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 03770<br>03780   |                  | DEC<br>JR   |                                   | DEC COUNTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                  | START            | LD          | 0,0                               | ; IF NOT DONE, GO BACK<br>; INITIAL CHAR COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03800            |                  | LD          | HL: 16336                         | :1ST CURSOR LOCATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 03810            |                  | L_D         | (HL), CURSOR                      | PRINT CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 03820<br>03830   | START1           | CALL        | KBCHAR<br>Ø                       | : CHECK KEYBOARD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ø384Ø            |                  | JR          | Z:START1                          | ;ANYTHING THERE ?<br>;IF NOT, CHECK AGAIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 03850            |                  | LD          | (CHAR)+A                          | SAVE CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 03860            |                  | CP          | 3<br>517 ASSETS                   | CTRL/C ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 03870<br>03880   |                  | JR<br>CALL  | NZ,CONT1<br>RESTOR                | ; IF NOT, 50<br>; RESTORE SCREEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 03890            |                  | JP          | RCV                               | ;ESCAPE BACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 03900            |                  | CP          | .3                                | ;CNTRL/C ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 03910<br>03920   |                  | JR<br>CALL  |                                   | ;IF NOT, GO<br>;RESTORE SCREEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03930            |                  | JP          |                                   | BACK TO MAIN ROUTINE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                  | CONT1            | CP          | ទ                                 | ;BACK SPACE ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 03950            |                  | JR          |                                   | ; IF NOT, GO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 03960<br>03970   |                  | LD<br>CP    |                                   | GET CHAR COUNT<br>FIRST CHAR ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03980            |                  | JR          |                                   | FIF SO, START OVER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 03590            |                  | DEC         |                                   | :DECREASE COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 04000            |                  | LD          | A+32                              | #BLANK<br>#BLANKS PREV CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 04010<br>04020   |                  | LD<br>DEC   | (HL)•A<br>HL                      | DEC CURSOR LOC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 04030            |                  | L.D         | (HLL), CURSOR                     | PRINT CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 04040            |                  | JR          | START1                            | GO BACK TO KEYBOARD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 104050<br>94060  |                  | OP<br>JR    | 13<br>Z,MOVE                      | ;CARRIAGE RETURN ?<br>;IF SO; GO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 04070            |                  | LD          |                                   | GET COUNT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 04080            |                  | CP          | 23                                | ;MAX FILENAME LEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 04090<br>041.00  |                  | JR<br>LD    |                                   | ;MUST HAVE CR; GO BACK<br>;GET CHAR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 04110            |                  | LD          | (HL),A                            | PRINT IT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 04120            |                  | INC         | HL                                | ;INCREASE CURSOR LOC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 04130            |                  | LD          | (HL), CURSOR                      | PRINT CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 04140<br>04150   |                  | INC<br>JR   | C<br>START1                       | ;INC COUNT<br>;GO CHECK KEYBOARD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                  | MOVE             | LD          | A, 32                             | ;BLANK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 04170            |                  | LD          |                                   | ;ERASE CURSOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 04180<br>04190   |                  | L.D<br>L.D  | 8:0<br>HL:16336                   | ;CHAR COUNT IN BC<br>;SOURCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 04200            |                  | L.D         | DE, DCB                           | ; DESTINATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 04210            |                  | LDIR        |                                   | ; MOVE FILENAME TO DOB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 04220            |                  | LD          | A, 13                             | :CARRIAGE RETURN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 04230<br>04240   |                  | LD<br>RET   | (DE),A                            | CARRIAGE RETURN IN DCB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 04250            | \$ ******        | ***         | RESTOR - RESTORES L               | AST 2 LINES TO SCREEN ********                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 04260            | RESTOR           | LD          | BC,128                            | ;# OF CHARS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 04:270<br>04:280 |                  | LD<br>LD    | HL.TEMPST<br>DE:16256             | ;SOURCE<br>;DESTINATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 04290            |                  | LDIR        |                                   | RESTORES LAST 2 ROWS TO SCREEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 04300            | )                | RET         |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                  | ;*****<br>FAST - |             |                                   | TO THE COMPUTER ********                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 04320            |                  | CP CP       | A <sub>7</sub> (HL)<br>Ø          | ;CHAR TO SEND<br>;ASCII ZERO ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                  |                  |             |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Listing 1 continued on page 464



### THE INFLATION FIGHTERS!

4116 250ns 8/89.50 100+ \$1.05 ea. 4116 200ns 8/\$11.00 100+ \$1.18 ea. 4116 150ns 8/\$13.50 100+ \$1.40 ea. 4116 150ns 8/\$15.50 100+ \$1.65 ea. 4116 120ns 8/\$15.50 100+ \$1.65 ea. 21141.200ns 8/\$12.00 4164 200ns 8/\$5.55 ea. 4164 150ns 85.55 ea. 46161 50ns 85.55 ea. 46161 50ns 85.50 ea.

\*\*1791 Disk Controller \$20.00 1777 Disk Controller \$17.50 \*\*280A CPU \$3.00 ea. 8251A \$4.00 ea. 2716: (5V)350ns 8/85.50 ea. \$6.25 ea. 2716: (5V)350ns 84.75 ea. \*\*2732 (5V)450ns \$4.75 ea. \*\*2732 (5V)450ns \$4.75 ea. \*\*2764 5V 300ns 28 pln \$12.00 ea. \*\*2764 5V 24 pln CALL \*\*2564 5V CALL \*\*8087 CALL 68000 CALL

Allow up to 3 wks. for personal checks to clear. Please include phone number. Prices subject to change without notice. Shipping 6 Handling for Chips \$3.50. FOB Bellevue, WA. for all else. Wash. residents add 6.5% Sales Tax.

CHIPS & DALE 10655 N.E. 4th St., Suite 400 Bellevue, WA 98004 1.206.451.9770

Circle 74 on inquiry card.



Circle 1 30 on inquiry card.



Circle 190 on inquiry card.

#### Listing 1 continued:

| 04340          | JIR  | Z:603      | ; IF SO, SKIP IT     |
|----------------|------|------------|----------------------|
| 04350          | CP   | 141        | GRAPHICS CHAR 2      |
| 04360          | JR   | NZ • GO:2  | ; IF NOT, SKIP       |
| 04370          | LD   | A,13       | : ;CARRIAGE RETURN   |
| 04380 602      | L.D  | (CHAR)+A   | SAVE CHAR            |
| 04390          | L.D  | (XMTBYT):A | ; PUT IN XMT BUF     |
| (044 (0V) (00) | CALL | RSTX       | TRY SENDING IT       |
| 04410          | JR   | Z+ GO1     | ;TRY AGAIN           |
| 04420          | CALL | AIDEO      | : PRINT CHAR         |
| (044304 663    | INC  | HL         | ; POINT TO NEXT CHAR |
| 19444C)        | DEC  | BC '       | ; DEC COUNTER        |
| 04450          | LD   | A+C        | ;LSB                 |
| 04450          | CP   | Ø          | ; DONE?              |
| 04470          | JR   | NZ:FAST    | ; IF NOT, GO         |
| (14430)        | RET  |            | ; DONE               |
| 04470          | END  | 5400H      |                      |
|                |      | 5400H      | ; DOME               |

Text continued from page 458:

operator to determine the characteristics you need.) Refer to your Model III reference manual for an explanation of the RSINIT ROM (read-only memory) subroutine.

After initialization is completed, the main program continues with line 560, which checks the RS-232C port. If nothing has been received, the keyboard is checked. If, however, a character was received, it is displayed on the screen and then the keyboard is checked. If no character is received from the keyboard, the RS-232C port is checked again. If a character is entered from the keyboard, it is transmitted to the computer out the RS-232C port and the port is checked for received data.

The VIDEO subroutine (line 1100) displays the character on the screen. Notice that there is no call to VIDEO following the keyboard check. This indicates the "full-duplex" mode—every character sent to the computer is echoed back so that a character entered from the keyboard is

displayed on the screen after it is received from the computer. If the computer operates in the "halfduplex" mode there is no echo, and characters entered from the keyboard must be displayed on the screen before they are sent to the computer. The terminal program has both fulland half-duplex capability and is initially in the half-duplex mode. To switch to full-duplex, simply press Control-D. To return to half-duplex, press Control-D again (this key toggles the duplex mode). If, at first, you find that characters entered from the keyboard are displayed twice on the screen, then the computer is in the full-duplex mode; toggle the terminal program to full-duplex. Incidentally, lines are not restricted to the screen width of 64 characters. Lines are terminated by the ENTER key and may be longer than 64 characters (though they will wrap around on the screen).

I decided to add a cursor, because it's hard to use the editor on the PDP-11/45 without one. The VIDEO

subroutine to accomplish this is necessarily complex. If you don't want a cursor you can define the cursor character to be an ASCII 32 instead of a 143 in line 210, or you can simply eliminate all lines in VIDEO that are associated with the cursor (there won't be much left).

When the PDP-11/45 receives a carriage return, it echoes back a carriage return as well as a linefeed character (ASCII 10). But the "linefeed-inhibit" feature keeps the video display from skipping a line. (If this feature causes problems with your printer, you can take it out.) The PDP-11/45 returns a linefeed even in the half-duplex mode, so a carriage return is not displayed following the keyboard scan in this mode. If you find that the computer you are using does not echo a carriage return, then you will want to delete the feature.

#### **Customized Versions**

There are three different versions of the terminal program. The first is for a Model III that has 16K or more bytes of RAM but no printer or disk drives. In this case you can modify the terminal program by deleting lines 230-440, 530, 550, 630-660, 700-950, and 1270-4480 and then assembling what is left. This is the simplified terminal program that permits your Model III to communicate with the remote computer.

## **Printer Option**

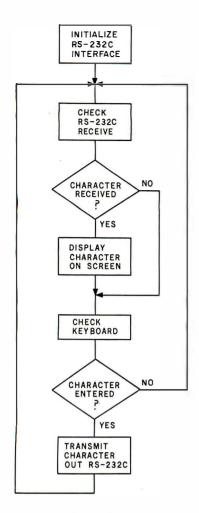
If you have a parallel printer, you'll want to use it to obtain program listings and hard copy of data output

## BTA MODEL 953B EPROM PROGRAMMER - \$359



- Programs 2508, 2758, 2516, 2716, 27C16, 2532, 2732, 2732A, 27C32, 2564, 2764, 27C64, MCM68766, 27128.
- RS-232, 3 line serial interface, Xon/Xoff format, DB-25 I/O connector.
- No personality modules software control EPROM selection.
- Extended diagnostics.
- LED warning indicates power applied to EPROM socket.
- Supports Intel, Motorola, and Intel 8086 data formats as well as HEX data dump.
- Automatic baud rate selection.
- Textool zero insertion force socket.
- Available CP/M software.
- Model 953A, programs most 24 pin EPROMS.

Price - \$269.00



**Figure 1:** Operation of the main section of the terminal program. The RS-232C board is controlled from the program.

from the computer. In the interest of simplicity, I decided to avoid any kind of handshaking or sending "stall" or pause characters when using a printer. But rather than output characters to the line printer as they

Key **Function Break** returns you to TRSDOS Control-D togales duplex mode Control-B opens buffer Control-O turns buffer off Control-E erases buffer Control-P dumps buffer to line printer Control-G dumps buffer to computer a line at a time Control-R reads from disk and dumps into buffer Control-W writes to disk Control-J jumps back and continues sending to computer Control-F fast transfer from disk to computer **Table 1:** Control commands for the terminal program.

are printed on the screen, I used the scheme that follows.

If you press Control-B, every character that appears on the screen thereafter is put into a buffer in the Model III. (See table 1 for a list of all program commands.) When the output ceases from the computer, press Control-P and everything that is in the buffer will be sent to the printer. If you want to stop printing before the entire contents of the buffer are printed, you can press Control-C to return to the terminal program. Control-C is used as an "escape" throughout the program.

Two other keys control the buffer. Control-O turns it off (i.e., closes off the buffer to character insertion). In addition, Control-E erases the buffer. (A listing of all control keys appears in table 1.)

The only disadvantage to using a buffer this way is that it has a limited

amount of space, so you may run out of RAM. I haven't found this to be a problem, though, even when the buffer is used for some disk operations as well. The assembled version of the terminal program occupies less than 1K bytes of RAM, which leaves at least 15K bytes of RAM for the buffer on a 16K-byte Model III.

The second version of the terminal program is for a Model III that has 16K or more bytes of RAM, a parallel printer, and no disk drives, as described above. Only the following lines should be deleted from the program in listing 1: 290-440, 780-940, and 1740-4480. In addition, the program should be moved down in memory as much as possible to maximize the size of the buffer. Make the changes in these addresses as listed in table 2. This version of the terminal program might be called the simplified program with printer capability.



| Line Number |     |       |
|-------------|-----|-------|
| 100         | ORG | 42F2H |
| 120 DUPLEX  | EQU | 42E9H |
| 190 CHAR    | EQU | 42EBH |
| 250 BUFLAG  | EQU | 42EAH |
| 260 BUFPTR  | EQU | 42ECH |
| 270 BUFNUM  | EQU | 42EEH |
| 280 BUFBEG  | EQU | 45AEH |
| 4490        | END | 42F2H |

**Table 2:** Memory address changes required for the printer option. Make these changes to the program in listing 1 to maximize the amount of memory in the buffer.

## Disk Drive Option

The third version of the program uses a Model III that has one or more disk drives, 32K or more bytes of RAM, and a parallel printer. This version is identical to the program in listing 1 and has two disk operations: (1) sending data from disk to the computer and (2) saving data received from the computer on disk.

The first operation employs two different methods to transfer data

from a disk to the computer. The first method is a line-by-line transfer and the second is a continuous transfer. A line-by-line transfer is desirable because I access a PDP-11/45, which, in the immediate mode, has an immediate diagnostic for BASIC. In other words, if a BASIC program line with a syntax error is entered, for example, the computer will respond immediately and return an error message. It's useful to be able to correct a line immediately after the error message is displayed.

The line-by-line transfer makes use of the buffer. When you enter Control-R from the keyboard, a window opens up on the screen. You are then asked to enter the name of the disk file you want loaded into the buffer. The file is then dumped into the buffer and the screen is restored to its previous configuration. If the buffer already has data in it, the disk file is added to it. You can erase the buffer first with a Control-E. You can also close the buffer with a Control-O so that other characters are not put into it. If you enter Control-C as one of the filename characters, the screen is restored and execution jumps back to the main program.

Pressing a Control-G sends the data in the buffer to the computer. It is sent one line at a time; the operation pauses after a carriage return is encountered. This gives the computer a chance to respond. To send the next line, just press any key (except Control-C).

To escape from this "send" mode, enter Control-C, which returns you to the main section of the program. If the computer sends an error message after you have sent a line, you can correct the line before continuing on to the next one. Enter the corrected line and then press Control-J, and the Model III will continue sending where it left off. This way, you can send and edit a relatively large program in just a few minutes. The bother of having to send a character after each line is offset by the convenience of being able to edit a line immediately after it has been sent to the computer.

In the unlikely event that you have a program whose size exceeds the buffer, simply save it on disk in segments. Then successively load each part, send it to the computer, erase the buffer, load the next part, send it to the computer, and so on. This way you can save a program of any size.

The second transfer operation, continuous send, is similar but even easier. When you press Control-F, you will be asked to enter a filename just as before. The contents of that file will be sent without pauses to the computer. The characters will be dis-

# IBM.CD/W. dabbye **VALENTINE DAY SPECIAL!!** IBM-PC SPECIALS: CP/M SPECIALS: APPLE SPECIA S: MICROSOFT PREMIUM PAK....\$479, MICRO-SCI disk drive....\$299 Controller....\$94. We carry all SOFTWARE and GAMES for APPLE EPSON MX80FT III....\$509, MX100 III....\$689, C'TOH Prowriter \$499, LETTER QUALITY PRINTERS ALSO AVAILABLE....CALL Suite #186 • 25422 Trobuco Rd., #105 El Toro, CA 92630 CP/N is a registered trademark of Digita Apple is a trademark of Apple Computer.

(714) 768-8114

played on the screen as they are sent. These characters are not put into the buffer, so there is no limit to the size of the program you send. The computer must be able to accept these characters as they are sent. If for some reason it is not ready, perhaps because of heavy use, some characters may be lost. Continuous send eliminates the need for handshaking or the use of stall or pause characters. There is no escape from the transfer operation; you must wait until the entire file has been sent.

The other disk operation, saving data sent from the computer, is easy as well. First put the incoming data into the buffer just as though you were going to output it to the printer. When the output has ceased, close the buffer with a Control-O so that no extraneous data is put into the buffer. Then enter a Control-W. You will be asked to enter a filename, after which the data will be written from the buffer to disk and the screen will be restored.

# A Few Final Notes

Some of the more popular word processors store data with zero as a final character. This will not present a problem, because the program disregards zeros. In addition, a carriage return is often stored as an ASCII 141 character. The program will translate that to an ASCII 13 so that it will not be displayed on the screen.

The program has no disk-error recovery routines, so if a disk error occurs (if the computer tries to read a nonexistent file, for example) the program will probably bomb. Don't panic; simply press the Reset button to reboot, reload the program, and you'll be back in business. Whatever you do, don't hang up the telephone, because you will probably still be logged in, and the next person who accesses the computer may get into your account. I didn't put in any diskerror recovery capability so that I could limit the length of the listing.

One final note of caution: if you press Control-J (jump back) without having jumped out in the first place, the program will almost certainly crash.

# IDM. USERS SAVE 25% ON YOUR PC UPGRADES

ANATRON MULTIFUNCTION RAM BOARD Standard \$450

Socketed for easy memory expansion • Each port individually disabled Parallel Printer Port may be configured as LPT1 or LPT2 or LPT3 Two RS 232 ports configured as COM1 and COM2 • Base address selectable on any 64 KB boundary • All features fully compatible with IBM PC

### **EVERYTHING FOR THE PC**

# HARDWARE

- Double Sided [320 kb] .....\$300.00 RAM Expansion Packages for Mother Board [16 kb] . . . Memory Expansion Board [64 kb] . . . . \$130.00 • Printers [NEC, EPSON, OKIDATA] .....\$CALL ● Monitors [NEC, TEKO, AMDEK] . . . . . . . \$CALL • Diskettes [3M singlesided] .....\$CALL • Extension Cables for:
  - Printer SCALL. Monitor [two cable set] . . . . . . . . \$CALL Keyboard .

#### SOFTWARE

- Condor DBMS
- Ed-Word® Screen Editor/Word Processor
- NECPRINT [NEC 8023AC print utility]
- GRAPHDUMP

Prices reflect 3% Cash Discount

More hardware and software coming. Call for details.

P.O. Box 401 **Terms FOB Saline** 

Disk Drives:

202 West Bennett Street, Saline, Michigan 48176

1-800 521-0521

Hours 9 a.m. — 5 p.m. E.S.T.

Michigan [313] 429-2678

# RHINO®/APPLE SYSTEM I

An integrated high-tech robotic package for education, research, and industrial planning. Hardware. Teaching software programs. Comprehensive instruction manual. Peripherals available. System includes:

- RHINO® XR-1 (Standard Hand, Standard Power Supply)  $-\frac{1}{4}$ " aluminum arm construction, optical encoders on each axis, six DC Servo Gear motors, digital design w/onboard microprocessor, built-in self-test program, 22.5" max. reach, 32" height, 1/4" width, 5 lb. lifting capacity
- Apple II + 48K
- Apple Disk II w/interface
- CCS 7710A RS-232C interface
- RHINO®/Apple interface cable
- Apple Monitor III Green 12"
- RHINO®/Apple software package #1
- RHINO®XR-1 "Introduction to Robotics" 250 pg. manual
- Tool kit for robotic arm
- Instruction for RHINO®/Apple hook-up
- Apple DOS 3.3 Software System w/manual
- Apple system manuals w/software instruction

Systems shipped F.O.B. Champaign, IL. Price & specifications may be altered without notice.



For information on the basic RHINO® system and other RHINO®/Apple integrated packages, contact:



Rhino Robots, Inc. 308 S. State, Champaign, IL. 61820 217/352-8485 TWX 910 245-0151

# Foreign



# Full-Stroke Keyboard for Atari

The B Key 400, a full-stroke keyboard, provides an alternative to the Atari 400's membrane keyboard. Manufactured by Inhome Software, the B Key 400 is easy to install and has all the features of a full-stroke

keyboard. It's available for \$119.95 from Inhome Software Inc., 2485 Dunwin Dr., Mississauga, Ontario L5L 1T1, Canada, (416) 828-0775.

Circle 550 on inquiry card.

# Large Keyboards for Disabled

Cacti Computer Services has designed an 11- by 21-inch pressure-sensitive keyboard system for individuals with limited hand or finger control. This system consists of a keyboard with widely spaced contacts, a driver routine, an interface to plug into the computer, connecting cables, and a plastic mask. Once the driver routine has been loaded, the computer's keyboard combines with the large keyboard to run commercially available

software without modifications.

Several keyboard layouts are offered, and custom arrangements can be made at no additional charge. The system is presently marketed for use with Apple and Commodore PET/CBM computers. It costs \$525. For full details, contact Cacti Computer Services, 130 9th St. SW, Portage la Prairie, Manitoba, R1N 2N4, Canada.

Circle 551 on inquiry card.

# Expansion Slots for Color Computer

Up to four separate peripherals can be simultaneously connected to Radio Shack's TRS-80 Color Computer with Maple Leaf Systems' Multiport, a multiple-slot expansion unit. Each peripheral is on line and accessible to a program by means of a POKE command. With Multiport, the Color Computer is able to switch between peripherals under software control, which allows a single program access to any or all peripherals at any time. Multiport is described as a powerful hardware circuit that connects directly to all models of the Color Computer.

Multiport comes assembled and tested for \$99.50, and full instructions are included. It's available from Maple Leaf Systems, POB 2190, Station C, Downsview, Ontario M2N 2S9, Canada. Circle 552 on inquiry card.

# Interfaces in Computing

Interfaces in Computing is an international journal for system designers, electronic engineers, technicians, and production managers concerned with computing technology. Topics addressed in this quarterly range from low-speed communications between microprocessors to high-performance buses linking mainframes. Hardware and software inter-

facing are given equal priority.

Annual subscriptions to Interfaces in Computing cost 160 Swiss francs (approximately \$89), including postage. Further details are available from Elsevier Sequoia S. A., POB 851, CH-1001 Lausanne 1, Switzerland; tel: (021) 20 73 81; Telex: 26 620 ELSACH.

Circle 553 on inquiry card.

# Microdoctor Diagnoses Computers

Dataman Designs' Microdoctor is an intelligent device to help engineers diagnose faults in computers and computercontrolled products. Microdoctor's built-in printer produces hardcopy printouts of preprogrammed tests on chips in addressing space. This device is capable of testing ROMs (read-only memories), RAMs (random-access read/write memories), and I/O and data lines. It can also be used for memory-mapping unknown systems and writing to or reading from any device in address or I/O space. Memory contents are printed out in hexadecimal or ASCII codes.

Microdoctor, a Z80-based product, comes with a Z80 disassembler that can be used to print out disassembled listings of the ROM in any Z80 system. Disassemblers for other microprocessors are available. The Microdoctor

costs £295. Contact Dataman Designs, Lombard House, Cornwall Rd., Dorchester, Dorset, DT1 1RX, England; tel: (0305) 68066; Telex: 418442. Circle 554 on inquiry card.

# **MISCELLANEOUS**



# **Computer Cases for** Commodore 64

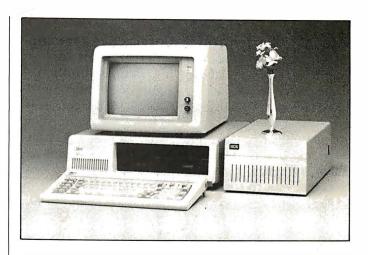
The Computer Case Company has added two carrying cases designed for the Commodore 64 to its product line. Made of luggage material with hard sides, brass hardware, and key locks, each case has room enough for additional equipment, papers, and manuals. Built-in rubber pads protect furniture, and steel lugs on the bottom protect the case when it's transported.

The CM703 case holds the Commodore, one or two disk drives, and the power supply. The CM704 case holds the computer, the data set program recorder, and the power supply. Both models can accommodate the Commodore VIC-20 and related equipment. These carrying cases are available at many computer stores or factory-direct from the Computer Case Co., 5650 Indian Mound Court, Columbus, OH 43213, (800) 848-7548; in Ohio, (614) 868-9464. Circle 555 on inquiry card.

# **ASUs Ease Selection** of Peripherals

Giltronix's series of automatic switching units (ASUs) is designed to facilitate automatic selection of peripherals by means of a computer or control device. ASUs give you remote peripheral options and the ability to select a printer, modem, etc. without leaving the keyboard. Giltronix ASUs have built-in software for unmanned computer-programmed control over peripherals. Networking capabilities are said to be enhanced through a specialized line-driving function. By connecting an ASU to a modem, remotesite port selection and operation can be achieved. Giltronix ASUs can switch RS-232C lines (TD, RD, RTS, CTS, DTR, DSR, DCD, and TC) and come configured for switching RS-232C ASCII/asynchronous data I/O devices.

Three models are currently available: the ASU3, ASU5, and ASU7 (three, five, or seven ports, respectively). Optional features include manual override and front-panel LED (light-emitting diode) monitoring. Prices range from \$449 to \$658. Full technical specifications can be obtained from Giltronix Inc., 970 San Antonio Ave., Palo Alto, CA 94303, (415) 493-1300. Circle 556 on inquiry card.



# **Expansion Frame** for the IBM PC

The PCX-6 expansion frame from RCS gives the IBM Personal Computer six additional system slots. Its fully socketed motherboard permits simple expansion by insertion of appropriate chips. Optional support equipment for the PCX-6 includes two asynchronous serial ports, three parallel ports, a realtime clock, and an extra heavy-duty power supply for running a 5¼-inch Winchester hard-disk drive inside the Personal Computer. RCS also offers 64K-byte memory increments (192K-byte maxi-

mum) featuring DPECC (dynamic parity error-correction circuitry). DPECC memory detects singleand double-bit parity errors and corrects single-bit errors without system processor overhead and without interrupts.

The PCX-6 can be purchased with or without the optional equipment installed. Prices begin at \$595. Full information is available from RCS Inc., 2116A Walsh Ave., Santa Clara, CA 95050, [408] 727-7548.

Circle 557 on inquiry card.

# Extra Slot for Apple Motherboard

Legend Industries' Soft 8 card plugs directly into the Apple II's slot 7 and provides slots 7 and 8. Switching between slots is software-driven, and you can shift back and forth between cards with simple software commands. With Soft 8, you can place nine software-accessible cards in your Apple.

Soft 8 is supplied with software that lets you modify standard Apple DOS so that it will recognize the added slot. The suggested retail price is \$84.95. Soft 8 is manufactured by Legend Industries Ltd., 2220 Scott Lake Rd., Pontiac, MI 48054, (313) 674-0953.

Circle 558 on inquiry card.

# Atari/CP/M Interface

USS Enterprises' Critical Connection provides the means to connect an Atari 400 or 800 to a CP/M svstem so that the Atari can use the CP/M system's printer, disk drives, and keyboard. This system is made up of hardware to connect an RS-232C port on a CP/M system to an Atari disk/ printer port, 50 feet of cable, and an 8-inch single-density disk with software that makes the CP/M system's drives, printer, and keyboard replace the Atari's.

The Critical Connection costs \$175. The company requests that you provide the name of the CP/M system to be connected to the Atari. For a brochure describing the Critical Connection and further purchasing information, contact USS Enterprises, 6708 Landerwood, San Jose, CA 95120, (408) 997-0264. Circle 559 on inquiry card.

# Floor Stand for Joysticks

The Grand Stand Company's joystick floor stand is designed for optimum positioning, comfort, and control. The company claims that it is an aid in eliminating wrist and elbow fatigue and improves finger dexterity. The stand is made from solid wood with a walnut finish and streamlined appearance. It costs \$34.95. Order from the Grand Stand Co., 4231 Bluebell Ave., Studio City, CA 91604. Circle 560 on inquiry card.

# Interactive Training Programs for **Professionals**

American Training International (ATI) produces interactive training programs for popular software packages. These programs are targeted for professional users and are designed for CP/M systems and the IBM Personal Computer. ATI's menu-driven software provides hands-on practice, and a course can be completed in an average time of less than 45 minutes. Each course contains a general introduction and periodic refreshers.

ATI complements the training disks with a user's handbook that serves as a referenced hard-copy version of the information covered. Current titles available include Plan-Power for Visicalc, D.B. Power for dBASE II. ATI-Power for IBM PC-DOS, and ATI-Power for CP/M. Each course costs \$75. For full details, contact ATI Inc., Suite 300, 3800 Highland Ave., Manhattan Beach, CA 90266, (213) 546-4725.

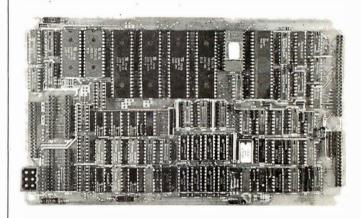
Circle 561 on inquiry card.

# Diagnostic Service for Immediate **Updates**, Solutions

Tele-Maintenance, a communications and diagnostic service from Rotating Logic Systems, provides immediate hard-disk analyses and software updates. According to the company, electronic analyses over toll-free telephone lines will ensure that correct service solutions are conveyed to the user's display screen or printer. Routing software updates and service inquiries to factory technicians will give customers on-the-spot service and corrections. Full particulars on the Tele-Maintenance service will be supplied by Rotating Logic Systems, Highland and White St., Greensburg, PA 15601, (412) 832-0140.

Circle 562 on inquiry card.

# **SYSTEMS**



# Compact Z80 Board

Davidge Corporation's DSB-4/6 single-board computer measures 10 by 53/4 by 3/4 inches—small enough to fit inside a 51/4-inch floppy-disk enclosure. The DSB-4/6 comes with a disk controller that automatically interfaces with both single- or double-density 51/4- and 8-inch floppydisk drives simultaneously, a Centronics-type parallel port, a parallel hard-disk port that provides 8-bit bidirectional I/O and A0 and A1 address lines, a 2K-byte boot EPROM (erasable programmable read-only memory), and 64K bytes of RAM (random-access read/write memory). The

DSB-4/6 can be configured for two or four RS-232C serial ports of which three can be used for standard peripherals; the fourth port is available for a modem. The company offers a choice of the 4-MHz Z80A or the 6-MHz Z80B processor.

In single units, the price for the DSB-4/6 ranges between \$695 and \$995, depending on processor and number of I/O ports desired. Quantity discounts are available. For complete details, contact Davidge Corp., Suite X, 1951 Colony St., Mountain View, CA 94043.

Circle 563 on inquiry card.

# **User-Friendly Multiuser System**

Z-Disk is a fully integrated desktop multiuser system designed for office or small business use from Product Associates Inc. This system features a simple menu-choice sequence and a mouse for easy menu selection. For each user. Z-Disk dedicates a processor module that contains a Z80 microprocessor, 64K bytes of RAM (random-access read/ write memory), and complete I/O capabilities. A master processor module supervises all user requests for shared storage and peripheral devices. Communication between the master processor and user modules is handled by a high-speed parallel bidirectional synchronous interprocessor data channel.

Standard features include a user-to-system interface that makes Z-Disk user-friendly for nontechnical users, two serial ports, one parallel port, and field-expansion capabilities for up to five users. System software is made up of MP/M, CP/NOS, and Comstar software, which provides this system with an extensive base of CP/M-compatible applications functions. The Comstar software gives Z-Disk integrated word-processing, planning, and communications capabilities. It uses an interactive prompting menu approach to guide users through application procedures.

Mass storage for Z-Disk includes up to 40 megabytes of Winchester disk drives and a floppy-disk drive. Single Z-Disks have a base price of \$2995; quantity and OEM (original equipment manufacturer) discounts are available. For full information, contact Product Associates, 465 Convention Way, Redwood City, CA 94063, (415) 364-3121. Circle 564 on inquiry card.

# Workstations Run **Two Concurrent** Jobs

Wordplex Corporation's 80-4 workstation can serve as the host computer in a three-terminal cluster. In an 80-4 network, the control station and its two satellites have individual displays and keyboards, 128K bytes of memory, and independent Z80 microprocessors. The control station has a doublesided double-density 5¼-inch floppy-disk drive (600K bytes of storage) and a 10-megabyte Winchester disk drive that's shared by all three workstations.

Wordplex's Gemini operating system highlights the 80-4 workstation. Gemini is said to give the 80-4 the processing power of two terminals in each satellite workstation through a Dualground processing technique. This process permits each satellite to load and run two concurrent tasks in main memory, with each job having a distinct screen image and keyboard buffer. Each workspace (ground) in the Dualground system comprises 32K bytes of dedicated memory. Also, a block of up to 24K bytes of memory is divided between the two workspaces and dynamically assigned as required.

The 80-4 offers users the option of running CP/M and CP/M-compatible applications on a stand-alone basis, and the cluster can have two ports for external communications. Optional equipment for the 80-4 workstation includes 51/4-inch double-sided double-density floppy-disk drives for the satellite terminals. A fully configured system costs less than \$8000 per workstation. For complete details, contact Wordplex Corp., 141 Triunfo Canyon Rd., Westlake Village, CA 91361, (213) 889-4455. Circle 565 on inquiry card.



# Mastermax Based on Z80/S-100

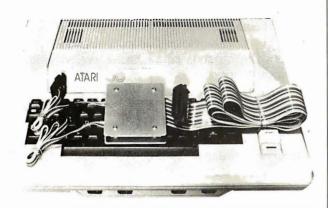
Mastermax, a four-slot S-100 Z80-based computer, is marketed by John D. Owens Associates. This single-card computer has dual 8-inch floppy-disk drives, 64K bytes of bankselectable RAM (randomaccess read/write memory), and a four-channel direct memory access controller. The floppy-disk controller can handle both single- and double-density data transfers and control up to four 51/4- or 8-inch disk drives in either DMA (direct memory access), interrupt, or programmed I/O modes. Mastermax also incorporates 4-MHz operation, IEEE 696.1/D compliance, the CP/M operating system, two

parallel I/O ports, and two RS-232C serial channels, one of which is programmable in either DMA, interrupt, or programmable I/O modes. When equipped with the TurboDOS multiuser operating system, Mastermax can accommodate four users accessing the same bus and database.

Options for Mastermax include 10-, 20-, and 40-megabyte Winchester hard-disk drives. With documentation, the basic system costs \$2540. Further information is available from John D. Owens Associates, 12 Schubert St., Staten Island, NY 10305, (212) 448-6283.

Circle 566 on inquiry card.

# **PERIPHERALS**



# Atari Printer Interface

Looking Glass Microproducts' Interface No.1 allows any printer with a Centronics-compatible parallel interface to be connected to an Atari 400/800 via controller jacks J3 and J4. The interface comes with a printerhandler that replaces the one resident in the Atari and occupies less than 128 bytes of user program area. The printer-handler is compatible with Atari cartridges and programs and comes on either cassette or disk.

Complete documentation, installation instructions, and program listings are supplied with Interface No.1. It costs \$85, which includes a 15-day moneyback guarantee. Dealer inquiries are invited. Full details are available from Looking Glass Microproducts, POB 5084, Loveland, CO 80537.

Circle 567 on inquiry card.

# Random-Access Printing

Interactive Structures, manufacturer of the Pkaso ID12 Color Printer Interface, has introduced the IS Pipeline print buffer. Featuring random-access printing, Pipeline lets you select sentences, paragraphs, graphs, or pictures from different programs or computers so that you can compose and print a finished document. Pipeline is useful for inserting graphs into reports, placing addresses on form let-

ters, and compiling letters out of component paragraphs. Standard operatina functions include conventional FIFO (first-in, first-out) operation, data compression for space saving, the ability to bypass buffer operations for straight-through printing, a simple erase feature to clear the buffer, and automatic duplication. The Pipeline's memory can be expanded from 8K bytes to 128K bytes, and the system is compatible with any Centronics-type parallel computer-printer connection.

Pipeline comes with a plug-in power supply, cabling, and manual. It's guaranteed for one year and ranges in price from \$195 to \$405, depending upon buffer size. For further details, contact Interactive Structures Inc., 146 Montgomery Ave., Bala Cynwyd, PA 19004, (215) 667-1713.

Circle 568 on inquiry card.

# Pac RAT Stores Up to 8 Megabytes

Damco's Pac RAT (random-access tape) gives you from 5 to 8 megabytes of on-line randomaccess storage (unformatted) in a package the same size and shape of a standard 51/4-inch floppy-disk drive. Each of Pac Rat's two magnetic tape cartridges has 88 tracks of 60 or 95 sectors (256-byte sectors) per track. A single read or write accesses each cartridge. Pac Rat's power requirements and controller interface are floppy-disk standard so that it can plug into existing systems. In small quantities, it costs less than \$480. Contact Damco, 2210 18th Ave., Rock Island, IL 61201, (309) 793-0655.

Circle 569 on inquiry card.

# 8086 Upgrade for Heath/Zeniths

Technical Micro Systems' H-1000 is an 8086 upgrade that replaces the

2-MHz Z80 board in Heath/ Zenith H-89/Z89 computers. This board retains all the Z80 board's features while providing a 16-bit 8086 processor, two additional I/O slots, 128K bytes of RAM Irandom-access read/write memory) that can be expanded to 1 megabyte, a dual-speed software-controlled clock for the Z80, and the ability to run the MS-DOS or CP/M-86 operating systems. It's completely compatible with existing Heath hardware and software. When in its 8086 mode, the H-1000 is softwarecompatible with Z-100 systems and the IBM Personal Computer under MS-DOS or CP/M-86.

In single units, the H-1000 costs \$1495. Full details are available from Technical Micro Systems Inc., Department H, 366 Cloverdale, Ann Arbor, MI 48105, (313) 994-0784. Circle 570 on inquiry card.

# Modem Operates Independently of Host

Visionary 100 is a 300-bps (bit-per-second) programmable 8085 microprocessor-controlled modem that operates independently of the host computer. When your computer is switched off or working on a task, this modem can automatically answer a telephone, receive and store a transmission in its memory, and activate a front-panel message-waiting indicator. Additionally, the Visionary 100 can print a message, complete with date and

time, to your terminal.

Standard features include an 8K-byte control program; a 2K-byte buffer that can be expanded to 24K bytes; a real-time clock and calendar; programmable auto-answer, auto-dial, auto-send, and reception; and storage and retrieval of telephone numbers, custom commands, and text files. Data formats provided are serial, binary, asynchronous 7 or 8 data bits, 1 or 2 stop bits, and no parity. Data rates of 300 or 1200 bps to the host machine and 300 bps to telephone lines are standard.

The Visionary 100 uses an RS-232C interface and is Bell System 100 series compatible (answer or originate). It costs \$595 from Visionary Electronics Inc., 141 Parker Ave., San Francisco, CA 94118, 14151 751-8811.

Circle 571 on inquiry card.

#### Printmate 99

MPI's Printmate 99 is an 80-column dot-matrix printer. It features a 1K-byte memory buffer, tractor and friction feeds. and built-in Centronicstype and RS-232C interfaces. It can print at 100 characters per second.

Options for the Printmate 99 include a 2K-byte memory buffer and a single-sheet feeder. The suggested price is \$695. Full specifications can be obtained from MPI, 4426 South Century Dr., Salt Lake City, UT 84107, (800) 821-8848; in Utah, (801) 263-3081.

Circle 572 on inquiry card.



# CP/M-86 and CP/M-80 Compatibility for Victor 9000

**PUBLICATIONS** 

**CP/M Software Index** 

Small Systems Engineering Corporation's Victor-80 plug-in card lets the Victor 9000 run either 16bit CP/M-86 or 8-bit CP/M-80 software. Victor-80 is based on Zilog's **Z**80 microprocessor and features up to 64K bytes of RAM (random-access read/ write memory) running at speeds of up to 6 MHz with no wait states. It plugs directly into any of the Victor's four internal expansion slots and permits all standard CP/M 2.2 software to run without modification.

The Victor-80 comes with a floppy disk containing two files for software toggling between CP/M-86 and CP/M-80. Files generated under either CP/M are structurally identical, and any file created under

The third edition of the

CP/M Software Index lists

more than 1600 programs

offered by 507 vendors.

Produced by the Small Sys-

tems Group, the index is

one operating system can be used by the other without restrictions. Other standard features of this card include a built-in Corvus hard-disk interface and the ability to accommodate as many as four Corvus 20-megabyte disks simultaneously. Optional high-speed backup capabilities include the Corvus Mirror and a video-cassette recorder.

In single units, the 4-MHz Victor-80-A card costs \$595, and the Victor-80-B. which operates at 6 MHz, lists for \$650. Complete information is available from Small Systems Engineering Corp., 1056 Elwell Court, Palo

organized into five major

areas: systems programs,

general applications, ac-

counting applications, util-

ity applications, and indus-

try-specific software. Each

#### Alto, CA 94303, (415) 964-8201. **New Release** Circle 573 on inquiry card. **Explores Database**

David Kruglinski's Data Base Management Systems is purported to be the definitive source for thorough and objective information on microcomputer database-management packages. It is intended to supply the information you need to intelligently decide how to buy

Software

entry gives a brief description, price, operating system versions, and the vendor's name, address, and telephone number. Many of the programs will run under CP/M-86, MP/M-80. MP/M-86, and Concurrent CP/M-86 and all are said to be available for the CP/M-80 operating system.

Single copies of the index cost \$10; outside North America, \$14, Order from the Small Systems Group, POB 5429, Santa Monica, CA 90405. Circle 574 on inquiry card.

# **Business Packages** Catalog

A free catalog featuring more than 40 business applications packages and publications for Apple II and III computer users is available from Monument Computer Service. It includes accounting, word processing, payroll, and medical billing programs. Contact Monument Computer Service, Village Data Center, POB 603, Joshua Tree, CA 92252, (619) 365-6668.

Circle 575 on inquiry card.

and use database-management software for your business. In this book, the capabilities of file, relational, and network/hierarchical systems are defined and standards for evaluating database-management software are provided. Several software packages are examined, including Condor Series 20, dBASE II, FMS-80, Datastar, and many others that run under CP/M.

Data Base Management Systems, a 256-page paperback book, costs \$16.95 and is available from Osborne/McGraw-Hill, 630 Bancroft Way, Berkeley, CA 94710, (415) 548-2805.

Circle 576 on inquiry card.

# Inside the Personal Computer

The revised edition of Tenley Design's Inside the IBM Personal Computer can be ordered from Starware. This book provides a detailed explanation of the system's operation and serves as a supplement to the IBM Personal Computer Technical Reference Manual. The theory behind the system board electronics is described, and a design for a multifunction I/O board that's compatible with the IBM's expansion slots is provided. Information on interfacing user-supplied hardware and software to the system is presented.

Inside the IBM Personal Computer costs \$12.95. It's published and distributed by Starware, 1701 K St. NW, Washington, DC 20006.

Circle 577 on inquiry card.



# **Directory Helps Consumers Compare** Software

Information Sources' Small Systems Software and Services Sourcebook is designed to help you avoid purchasing programs that don't fill your needs. In nontechnical terms, this work describes the applications and limitations of 1300 minicomputer and microcomputer programs for machines manufactured by Apple, Commodore, Data General, Digital Equipment Corporation, Hewlett-Packard, Honeywell, NEC, and Zenith. This book, which is more than 500 pages, also gives you data on related services, hardware and operating system compatibility, purchasing terms, and vendors.

The Small Systems Software and Services Sourcebook is a limited

edition available at a oneyear subscription rate of \$125. A 600-page comprehensive supplement with up-to-the-minute listings is included with each subscription. For further details, contact Information Sources Inc., 1807 Glenview Rd., Glenview, IL 60025, (312) 724-9285. Circle 578 on inquiry card.

# Comprehensive Software Catalogs

Queue has produced three free catalogs describing discount and educational software. Queue Catalog #10 lists more than 100 programs for the Atari, and Catalog #11 focuses on programs for the VIC-20. Listing several thousand programs from more than 140 publishers, Catalog #12 is devoted to the Apple computer.

Queue's educational software catalogs cover all grade levels from kindergarten (Catalog #8) to college (Catalog #9) and Apple, PET, and TRS-80 computers. To order, specify computer and catalog number. Queue Inc., 5 Chapel Hill Dr., Fairfield, 06432, CT(203) 335-0908.

Circle 579 on inquiry card.

# SOFTWARE

# Orbquest

Orbquest is a roleplaying CP/M game from Digital Marketing Corporation. The game, set in a fantasy universe, challenges you with everchanging situations where monsters and pitfalls confound your search for an orb buried in a multilevel dungeon. With each journey into the dungeon, you gain experience and magical powers that make you stronger and help you get closer to the glittering

Orbquest requires a 56K-byte CP/M system and a cursor-addressable terminal. It costs \$39.95. including a manual. It's available from Digital Marketing Corp., 2670 Cherry Lane, Walnut Creek, CA 94596, (415) 938-2880.

Circle 580 on inquiry card.

# Free IBM PC **Programs**

B&L Computer Consultants is offering two free programs for the IBM Personal Computer. Electronic Disk causes system RAM (random-access read/write memory) to emulate a 160K-byte disk drive. It's said to be 50 times faster than a drive. This program requires 256K bytes of memory and is referenced as drive C. Electronic Disk can be employed in any application where a regular disk drive is being used.

New Reset provides two types of resets to DOS. The resets use the Control 1, Control 2, and Control 3 keys for single-handed control operation. Control 1 functions exactly like the IBM's Control ALT DEL sequence, and Control 2 functions similarly except



# Alspa Computer, Inc.

The price-performance leader. Includes Z80A, 1 or 2 full 8" drives (double density, double sided), 3 serial and 1 parallel port, and winchester port. Prices start at less than \$2000. DEALER and OEM inquiries invited.

# SPECIALS on INTREGATED CIRCUITS

| 6502<br>6502 <b>A</b> /6512A<br>6520 PIA | 7.45<br>8.40<br>5.15 | 10/ 6.95<br>10/ 7.95<br>10/ 4.90 | 50/735   | 100/ 6.15<br>100/ 6.90<br>100/ 4.15 |
|------------------------------------------|----------------------|----------------------------------|----------|-------------------------------------|
| 6522 VIA                                 | 6.45                 | 10/6.10                          | 50/575   | 100/ 5.45                           |
| 6532                                     | 7 90                 | 10/740                           | 50/700   | 100/6.60                            |
| 2114-L200                                |                      | 2 4 5                            | 25/ 2 30 | 100/2.15                            |
| 2716 EPROM                               |                      | 4.90                             | 5/4.50   | 10/4.00                             |
| 2532 EPROM                               |                      | 7 90                             | 5/745    | 10/6.90                             |
| 6116 2KX8 CMO                            | S RAM                | 7.90                             | 5/ 7 45  | 10/690                              |
| 4116 RAM                                 |                      |                                  |          | 8 for 14                            |
| Zero Insertion Ford                      | e 24 pir             | Socket (S                        | canbe)   | 2.00                                |



#### Signalman Modems Anchor Automation FREE SOURCE MEMBERSHIP WITH SIGNALMAN

All Signalman Modems are Direct Connect, and include cables to connect to your computer and to the telephone. Signalman Modems provide the best price-performance values, and start at less than \$100 Dealer and DEM inquiries invited

Mark I RS232

Mark II for Atari 850 Mark IV for CBM/PET with software

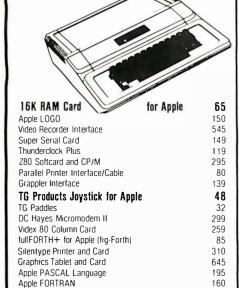
Mark V for Osborne (software available)

Mark VI for IBM Personal Computer

Mark VII Auto Dial/Auto Answer Mark VIII Bell 212 Auto Dial/Answer

DC HAYES Smartmodem 229 RS232 MODEM — Accoustic RS232 MODEM — CCITT frequencies 119 175

We carry Apple II+ from **Bell & Howell** 



# **G**commodore

See us for Personal, Business, and Educational requirements. Educational Discounts available

PETSCAN \$245 base price

Allows you to connect up to 35 CBM/PET Computers to shared disk drives and printers. Completely transparent to the user. Perfect for schools or multiple word processing configurations. Base configuration supports 2 computers. Additional computer hookups \$100 each

Commodore COMMUNICATES!

COMPACK

12

20

11

Я

125

Intelligent Terminal Package includes ACIA hardware based interface. DB25 Cable and STCP Software with remote telemetry, transfer to/from disk, printer output, XON-XOFF control, user program control, and status

# **VE-2 IEEE to Parallel Interface**

Includes case, power supply, full 8-bit transmission, and switch selectable character conversion to ASCII

| VIC 20                | 189     | VIC Sargon II Chess   | 32 |
|-----------------------|---------|-----------------------|----|
| VIC Printer           | 335     | VIC GORF              | 32 |
| VIC 3K RAM            | 32      | Meteor Run (UMI)      | 39 |
| VIC 8K RAM            | 53      | VIC Radar Ratrace     | 24 |
| VIC 16K RAM           | 99      | Amok (UMI)            | 20 |
| VIC Disk Drive        | 395     | Snakman               | 15 |
| VIC Pinball           | 32      | Rubik's Cube          | 13 |
| VIC Omega Race        | 32      | Programmers Reference | 15 |
| Spiders of Mars (UMI) | 39      | Renaissance (UMI)     | 39 |
| VIC Draw Poker        | 24      | VIC Superslot         | 23 |
| VICTO                 | ORY Sof | itware for V1C        |    |
| Street Sweepers       | 12      | Maze in 3-D           | 12 |
| Night Rider           | 11      | Cosmic Debris         | 12 |

| 1.1                                         | COSTILL DEDITS                                       | 12                                                                                                                            |
|---------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 12                                          | Grave Robbers Advent                                 | 11                                                                                                                            |
| 12                                          | Games Pack II                                        | 12                                                                                                                            |
| 8                                           | Adventure Park I                                     | 12                                                                                                                            |
| 12                                          | Trek                                                 | 11                                                                                                                            |
| TNW 488/103 with DAA 45                     |                                                      |                                                                                                                               |
|                                             |                                                      |                                                                                                                               |
| Computer's First Book of PET/CBM            |                                                      |                                                                                                                               |
| POWER ROM Utilities for PET/CBM             |                                                      |                                                                                                                               |
| WordPro 3+ - 32K CBM. disk, printer         |                                                      |                                                                                                                               |
| WordPro 4+ - 8032, disk, printer 3          |                                                      |                                                                                                                               |
| SPELLMASTER spelling checker for WordPro 17 |                                                      |                                                                                                                               |
|                                             | 12<br>8<br>12<br>AA<br>of PET<br>for PET<br>8M. disk | 12 Grave Robbers Advent 12 Games Pack II 8 Adventure Park I 12 Trek  AA OI PET/CBM for PET/CBM M. disk, printer disk, printer |

| OI ELEMANTER Spenning Checker for Words to | 170 |
|--------------------------------------------|-----|
| COPY-WRITER Professional Word Processor    | 159 |
| VISICALC for PET. ATARI, or Apple          | 190 |
| PETRAX PET to Epson Graphics Software      | 35  |
| SM-KIT enhanced PET/CBM ROM Utilities      | 40  |
| Programmers Toolkit - PET ROM Utilities    | 35  |
| PET Spacemaker II ROM Switch               | 36  |
| 2 Meter PET to IEEE or IEEE to IEEE Cable  | 40  |
| Dust Cover for PET, CBM, 4040, or 8050     | 8   |
| VIC or C64 Parallel Printer Interface      | 85  |
| CmC IEEE-RS232 Printer Interface - PET     | 120 |
| SADI Intelligent IEEE-RS232 or parallel    | 235 |

| Library of PET Subroutines                   |
|----------------------------------------------|
| Programming the PET/CBM (Compute!) — R. West |
| Computel First Book of VIC                   |
| Whole PET Catalog (Midnight Gazette)         |

Color Chart Video Board for PET

160

145

250

225

115

160

120

| Super Graphics — BASIC Language Exercises                                                       | 45            |
|-------------------------------------------------------------------------------------------------|---------------|
| KMMM PASCAL for PET/CBM EARL for PET/CBM Disk-based ASSEMBLER                                   | 85<br>65      |
| FORTH for PET full FIG model — Cargill/Riley Metacompiler for FORTH for independent object code | \$50<br>30    |
| FlexFile for PET/CBM Database, Report Writer with Calculations, Mailing L                       | 3110<br>.ists |
| PET Fun and Games (Cursor)                                                                      | 1             |

Fast machine language graphics routines for PET/CBM RAM/ROM for PET/CBM 4K \$75 8K \$90

A B Computers 215-822-7727

# DISK **SPECIALS**



SCOTCH (3M) 5" 10/ 2.30 50/ 2.10 SCOTCH (3M) 8" 10/ 2.45 50/ 2.20 100/215

# We stock VERBATIM DISKS Write for Dealer and OEM prices.

BASF 5" or 8" 10/ 2.00 20/ 1.95 100/ 1.85 Wabash 5" 10/ 1.80 50/ 1.75 100/170 Wabash 8" 10/ 2.00 50/ 1.95 100/190

# We stock MAXELL DISKS Write for dealer and OEM prices.

Disk Storage Pages 10 for \$5 Hub Rings 50 for \$6 Disk Library Cases 8"-300 5"-225 Head Cleaning Kits 11

## CASSETTES-AGFA PE-611 PREMIUM

High output low noise 5 screw housings 10/.61 50/.58 100/50 C-30 10/ 85 50/.82

# **SPECIALS**

Timex/Sinclair Computer 79 Zenith ZVM-121 Green Phosphor Monitor 109 VOICE BOX Speech Synthesizer (Apple or Atari) BMC Green and Color Monitors

#### Many printers available (Star. Brother, OKI, etc.) We Stock AMDEK Monitors

6-pen 1395 Watanabe Intelligent Plotter 1095 Staticide anti-static spray 390 dBASE II Panasonic TR-120M1P 12" Monitor (20 MHz) 149 Panasonic CT-160 Dual Mode Color Monitor 285 Franklin Computers - special system price Hewlett Packard Calculators

USI Video Monitors—Green or AMBER 20 MHz hi-res Dealer and OEM inquiries



## ALL BOOK and SOFTWARE PRICES DISCOUNTED

15% OFF A P Products **SALE 189** Synertek SYM-1 Microcomputer

# KTM-2/80 Synertek Video and Keyboard KTM-3/80 Synertek Tubeless Terminal



Z90-80 64K Z90-82 64K, 1 double dens. drive 2245 Z37 1 3 Megabyte Dual Drive 1355 Z19 Video Terminal (VT-52 compatible) 695 ZT-1 Intelligent Communications Terminal 479 Z100 16-bit/8-bit System CALL





| 1,000                |      | 0. 20                |      |
|----------------------|------|----------------------|------|
| 800 Computer         | 669  | Microsoft BASIC      | 72   |
| 400—16K              | 269  | MISSILE COMMAND      | 29   |
| 810 Disk Drive       | 440  | ASTEROIDS            | 29   |
| 825 Printer          | 625  | STAR RAIDERS         | 34   |
| 850 Interface        | 170  | Space Invaders       | 29   |
| Inside Atari DOS     | 18   | Music Composer       | 35   |
| Joysticks or Paddles | 19   | Caverns of Mars      | 33   |
| 16K RAM (Microtek)   | 69   | PAC-MAN              | 36   |
| 32K RAM (Microtek)   | 99   | CENTIPEDE            | 36   |
| Pilot                | 65   | First Book of Atari  | 11   |
| Super Breakout       | 29   | Anchor Modem—Atari   | 85   |
| APX Software         | Call | Other Atari products | Call |
|                      |      |                      |      |

WRITE FOR CATALOG
Add \$1.25 per order for shipping. We pay balance of UPS surface charges on all prepaid orders. Prices listed are on cash discount basis. Regular prices slightly higher. Prices subject to change.

We stock EDUWARE Software GENIS I Courseware Development System

PIE Writer Word Processor

Colmar, PA 18915

252 Bethlehem Pike

Unicom Grade Reporting or School Inventory

Apple Dumpling (Microtek) Printer Interface

Executive Briefing System with fonts

Apple Dumpling with 16K Buffer

that the memory is not erased. Control 3 does not involve rebooting from floppy disk; it merely returns you to the DOS prompt.

To receive these proarams, send \$6 to cover disk and handling costs to B & L Computer Consultants, Free Programs Numbers 1 and 3, 226 South Cole, Boise, ID 83709. A contribution of \$15 and \$10, respectively, is requested if you find these programs useful. Circle 581 on inquiry card.

# Workshop Helps Atari Programmers

The Disk Workshop from Synergistic Software, a set of seven utility programs for Atari 400/800 computers, is designed to help you with programming functions. Disk Workshop includes disk-editing capabilities, fast copying of disks, a formatted disk directory that can be sent to a printer, the ability to use machine-language character strings in BASIC, a screen dump for the Epson MX-80 printer outfitted with Graftrax or Graftrax Plus, and the ability to transfer large files to disk or cassette. One program in the set, Micro-DOS, gives you a RAM-resident program similar to Atari's DUP.SYS. Micro-DOS is online and available at any

The Disk Workshop requires 32K bytes of memory and a single disk drive.

It costs \$34.95 and is available from Synergistic Software, Suite 201, 830 North Riverside Dr., Renton, WA 98055, (800) 426-6505; in Washington, (206) 226-3216.

Circle 582 on inquiry card.

# 8087 Coprocessor **Products**

Microware has introduced a line of products for the 8087 coprocessor implementation on the IBM Personal Computer. The Fastpak includes Intel's 8087 numeric data processor, installation instructions, and your choice of four programming languages. The 87/88 Guide, a handbook on using the 8087 processor, accompanies this package. This guide introduces 8087 programming using 87Macro and the IBM Macro Assembler or the CP/M-86 assembler. In addition, it has assembly-language listings that can be keyed in and run on the IBM. The guide can be purchased separately for \$18.95. Fastpak is \$375.

Microware is marketing a variety of languages for use with the processor, most of which require a 128K-byte IBM PC with one disk drive and a compiler. 87Pascal, a library of floating-point routines that directly drive the 8087, is said to increase the speed and accuracy of Pascal programs. For applications demanding numerous transcendentals, roots, or powers, Microware offers 87FORTRAN. The 87BASIC package allows you to

perform both single- and double-precision arithmetic with the 8087.

timesaving 87Macro is designed for applications requiring the full power of the chip. It contains a preprocessor that generates the complete 8087 instruction set and a library of macroinstructions and subroutines to simplify writing 8087 code. A double-sided double-density disk drive and the IBM Macro Assembler are required.

Each language is available as part of Fastpak or separately for \$125. For details, contact Microware Inc., POB 79, Kinaston, MA 02364, (617) 746-7341. Circle 583 on inquiry card.

# Modula II Language Lifts Pascal's Restrictions

Volition Systems' Modula II is said to be a simple but powerful high-level programming language that solves the problems inherent in Pascal. Serving as an alternative to assembly language, C, and Ada for systems programming, this language was designed by Niklaus Wirth, the creator of Pascal. Modula (MODUlar LAnguage) features include modules, processes, separate compilation, dynamic array parameters, and low-level machine access. It consists of a p-code interpreter that's upward compatible with the Apple Pascal interpreter, a onepass compiler, a librarymanagement utility, and a standard module library.

A small language supple-

mented by library modules, Modula II requires a 64K-byte Apple II with the Apple Pascal operating system. The initial release provides access to the Apple Pascal file system and UCSD Pascal intrinsics by means of library modules. The compiler accepts the full Modula II language, as defined in the ETH Zurich Modula II report, with minor implementation restrictions. Programs are compiled into p-code.

Modula II costs \$550. Quantity discounts are offered. Updates and usersupport via electronic mail are also available. For further details, contact Volition Systems, POB 1236, Del Mar, CA 92014, (714) 457-3865.

Circle 584 on inquiry card.

# Where Do New **Products Items** Come From?

The information printed in the new products pages of BYTE is obtained from "new product" or "press release" copy sent by the promoters of new products. If in our judgment the information might be of interest to the personal computing experimenters and homebrewers who read BYTE, we print it in some form. We openly solicit releases and photos from manufacturers and suppliers to this marketplace. The information is printed more or less as a first-in first-out queue, subject to occasional priority modifications. While we would not knowingly print untrue or inaccurate data, or data from unreliable companies, our capacity to evaluate the products and companies appearing in the 'What's New?' feature is necessarily limited. We therefore cannot be responsible for product quality or company performance.

# **EPSON**

MX 80 F/T III MX 100 III 100 CPS

**BOTH WITH GRAFTRAX+** 

**HX-20 COMPUTER** 

Cards and cables for all computers Please Call For Best Prices

# **OKIDATA**

32 A \$399°° 33 A \$649°°

# **BASIS 108**

APPLE COMPATIBLE COMPUTER CALL FOR LOWEST PRICE

# **16K RAM CARD**

Compatible with: DOS 3.3, CP/M, Visicalc, PASCAL 2 YR. WARRANTY

\$5900



# **SOFTWARE**

WE HAVE IT ALL! OVER 500 TITLES

• APPLE • CP/M • IBM • ATARI PARTIAL LISTING

| ACCOUNTING PLUS     | \$CALL |
|---------------------|--------|
| ALIBABA             | \$CALL |
| ARCADE MACHINE      | 31.00  |
| AZTEC               | \$CALL |
| BPI — G/L, A/R, A/P | 299.00 |
| CURSE OF RA         | 15.00  |
| DB MASTER           | 169.00 |
| FIRST CLASS MAIL    | 59.00  |
| FLIGHT SIMULATOR    | 27.00  |
| FROGGER             | \$CALL |
| HOME ACCOUNTANT     | 59.00  |
| KNIGHT OF DIAMONDS  | 25.00  |
| MICRO-PRO           | \$CALL |
| MICROSOFT           | \$CALL |
| PEACHTREE           | \$CALL |
| PERFECT SOFTWARE    | \$CALL |
| PFS                 | \$CALL |
| RASTER BLASTER      | 22.00  |
| SUPERCALC           | 215.00 |
| TEMPLE OF APSHAI    | 27.00  |
| WORD HANDLER II     | 139.00 |
| WIZARDRY            | 35.00  |
| ZORK I, II, III     | 27.00  |
|                     |        |

# HARDWARE

WE CARRY MOST PRODUCTS. PLEASE CALL IF NOT LISTED

#### PARTIAL LISTING

| DISK LIBRARY CASE      | 2.50   |
|------------------------|--------|
| FLIP FILE              | 20.00  |
| GRAPPLER +             | 139.00 |
| HAYES MICROMODEM II    | 269.00 |
| JOYPORT                | 49.00  |
| KRAFT JOYSTICK         | 47.00  |
| M & R ENTERPRISES      | \$CALL |
| MX-80 PRINTER STAND    | 19.00  |
| MX-PLUS                | 45.00  |
| MICROBUFFER II 32K     | 239.00 |
| MICRO-SCI DRIVES       | \$CALL |
| MICROSOFT IBM RAMCD    | 299.00 |
| MICROSOFT SOFTCARD     | 239.00 |
| NOVATION PRODUCTS      | \$CALL |
| PAYMAR L/CASE, REV.7   | 20.00  |
| PKASO                  | 159.00 |
| PRACTICAL PERIPHERALS  | \$CALL |
| SHIFT KEY MODIFICATION | 12.00  |
| VISTA PRODUCTS         | \$CALL |
| WILDCARD               | 119.00 |
| WIZARD BPO             | 159.00 |
|                        |        |

# VISICORP\*

## IBM-APPLE II- APPLE III

| Visilink (Apple)        | 179.00 |
|-------------------------|--------|
| Visicalc (IBM or Apple) | 179.00 |
| Desktop Plan II (Apple) | 179.00 |
| Desktop Plan (IBM)      | 249.00 |
| Visidex (IBM or Apple)  | 179.00 |
| Visifile (Apple)        | 179.00 |
| Visifile (IBM)          | 249.00 |
| Visiplot (Apple)        | 145.00 |
| Visischedule (Apple)    | 229.00 |
| Visiterm (Apple)        | 75.00  |
| Visitrend/Plot (Apple)  | 229.00 |
|                         |        |

# ×

# **Mountain Computer**

| CPS Card          | 159.00 |
|-------------------|--------|
| CPS Cable         | \$CALL |
| Ramplus+32K       | 145.00 |
| Rom Writer        | 145.00 |
| Clock             | 195.00 |
| Music System      | 299.00 |
| Super Talker      | 149.00 |
| Expansion Chassis | 559.00 |
| Card Reader       | \$CALI |
| A/D-D/A           | 269.0  |
| Visicalc Expander | \$CALI |
|                   |        |

# **QUENTIN**

5 1/4" DRIVE **269**00

# SATURN

| 64K           | \$31900 |
|---------------|---------|
| 128K          | 45900   |
| V-C Expand 80 | 9900    |

# Legend Industries

| 64K (Includes V-C plus)                 | \$29900 |
|-----------------------------------------|---------|
| 128K (Inc. Videx V-CALC 80 w/mem. exp.) | 47900   |
| Pascal Super Systems                    | \$CALL  |

# Verbatim.

| 5 1/4" (100)      | \$23995 |
|-------------------|---------|
| 5 1/4" (10)       | 2595    |
| 8" (10)           | 3995    |
| Head Cleaning Kit | 750     |

# KENSINGTON MICROWARE



- Surge Suppression
- Dual OutletU.L. Listed
- Fits Apple Stand

\$65

# G Products

| Paddles       | \$2900 |
|---------------|--------|
| Joystick II   | 4000   |
| Select-A-Port | 4700   |
| All of Above  | 10900  |
| Trakball      | \$CALL |
| Joystick III  | \$CALL |
| Joystick IBM  | 4500   |

# MONITORS

| BMC 12" Green Au  | 8800   |
|-------------------|--------|
| BMC 12" Green Eu  | 12900  |
| USI PI3-12" Amber | 16900  |
| USI PI4-9" Amber  | 15900  |
| NEC 12" Green     | 17900  |
| NEC 12" Color     | 34900  |
| AMDEK             | \$CALL |
| SANYO             | \$CALL |
|                   |        |

# Videx

| 80 Column               | \$23900 |
|-------------------------|---------|
| Enhancer II             | 11900   |
| Softswitch              | 2500    |
| Function Strip          | 5900    |
| Inverse Video           | 1900    |
| Applewriter Pre-Boot    | 1900    |
| Visicalc 80 Software    | 4900    |
| Visicalc 80 w/mem. exp. | 7400    |

# **EPSON RIBBONS**

MX 80 MX 100  $^{\$}$   $7^{00}_{ea}$  or 3 for  $20^{00}$   $11^{00}_{ea}$  or 3 for  $32^{00}$ 

DEALER INQUIRIES INVITED



COMPUTER DISCOUNT PRODUCTS

MAIL ORDERS & RETAIL STORE

860 S. Winchester Blvd. San Jose, CA 95128

(408) 985-0400

HOURS: MON-FRI 8AM - 7PM - SAT & SUN 10AM - 4PM







# MEI (415) 873-3055 DYNAMIC RAMS 4116-200ns STATIC RAMS 2016P... 2016P-1 6116LP-3 **FPROM**s 2716. 4.25 2732 2732-200ns 2532-450ns . Z80 FAMILY..... CALL FOR WHOLESALE PRICING MORE "I C's" In STOCK MINIMUM ORDER: \$25.00

Circle 285 on inquiry card.

# **MICRO-USERS:**

PUBLICATION EXPLOSION BUGGING YOU?

Now, up-to-date abstracts of features, hardware/software, book reviews, programs, etc. from popular micro publications.

Search and select YOUR topics of interest. Subscribe to:

Peek

Journal of Micro Abstracts \$30.00 / 12 months

Send check/MO, name & address to:

B. Skovronek, Ed. 88 Moraine Road Morris Plains, N.J. 07950

Systems, business, utility, education, home, technical, and occasionally, games.



Circle 170 on inquiry card.



Call Free (800) 235-4137 for prices and information. Dealer inquiries invited. C.O.D. and charge cards accepted.



VISA'

PACIFIC **EXCHANGES** 

100 Foothill Blvd. San Luis Obispo, CA 93401. In Cal. call (800) 592-5935 or (805) 543-1037.

Circle 318 on inquiry card.

# ☆☆ SUPER™ ☆☆ ISA's DATABASE

The only DBMS with all these features:

- PROVEN in one year of test marketing TOUGH, reliable file structure
- MENU driven for simplicity and easy use ARITHMETIC with stored calculations
- FAST set-up and report formating CLEAR user-oriented documentation
- PRINTS totals & subtotals mail labels
- REFORMATS and merges data files MULTI-DISK files: Up to 128K records SORTS full disks on up to 40 fields
- PRODUCTION input of repetitive data
  USE existing data files
  COUPLES to word processors
  POSTS transactions to master file

- SEARCH by strings, ranges, comparisons DATA COMPRESSION: Over twice as
- many labels as the other system

For TRS-80\* Models I, II, III, & 16 – 250.00 CP/M† – 295.00

Ask your Dealer or Write.

Institute for Scientific Analysis, Inc. P. O. Box 7186, Dept. B-2 Wilmington, DE 19803 (215) 358-3735

\*T.M. Tandy Corp.

† T.M. Digital Research

Circle 209 on inquiry card.

# New Sources of S-100 Buss

Mainframes & Disk **Enclosures** 

Power Regulation meeting previous standards

# **Ann Arbor Terminals**

60 Lines Display 48 Programmable Keys 1,499 prepaid

CALL FOR PRICES **MICRO MIDWEST** 10205 W. 69 TERR. MERRIAM, KS. 66203 913-362-3462

Expand Your

Circle 260 on inquiry card.



#### LOGICSIM • •



CP/M based professional logic simulator

- ★ For gate-array, custom and all other IC designers
  ★ For digital system engineers

Ninc logic states, ability to simulate ITL/NM®S/CMOS/PMOS logic, ROM's ind RAM's, three-state and transfer gates, wired-of'ed nodes, propagation telays spike and race analysis expandable pin-number based ITL macrolibrary plus numerous other features make LOGICSIM comparable to industry tandard simulators.

Try it now. Send us a \$30check for LOGIC SIM demo copy and User's Manual.

Please specify 8" IBM 3740/5" APPLE II (13/16 sector). CP/M based 56K to 64K systems (APPLE's with CP/M card). Introductory price \$276.

nore information, call (408) 578-8096, Or write: ASSOCIATES, 5589 Starcrest Dr., San Jose, CA 95123

PPLE. CF/M. LOGICSIM are trademarks of Appl omputer. Digital Research and E/Z ASSOCIATE

# \*ADDS\*

# VIEWPOINT TERMINALS

\$495

In addition EPI carries printers DEC & DG compatible terminals and modems. Items in stock are shipped within 24 hours. ALL orders shipped COD. All items are new and in factory cartons with manufacturers warranties.

# PERIPHERALS INC.

# **ECONOMY**

(404) 952-0213

# Circle 158 on Inquiry card.

# With the new ASCIFOUrPortintelligent switch all your RS-232C networking problems can be solved. Whatever your switching applications the ASCI Switch allows you lo switch with ease, because the switch is intelligent it allows you to Change between peripherals from your keyboard. The code can even be imbedded in your text. When you consider the time you saved due to the simplicity of installation, the clinination of extra cabling and the exclusion of knot turning the ASCI Four Port intelligent switch is the perfect way to expand your net. perfect way to expand your net-working capabilities. Advanced Systems Concepts, Inc. (213) 793-8971

"THE ORIGINAL BIG BOARD"

**OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC** 

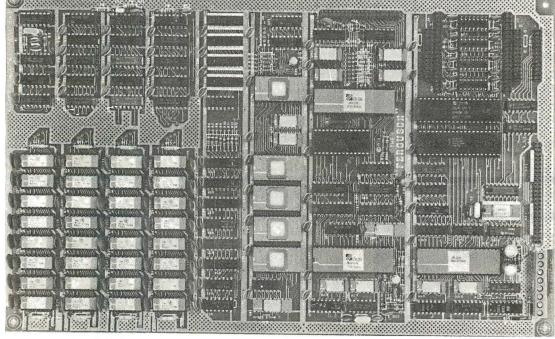
# SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

(DO NOT CONFUSE WITH ANY OF OUR FLATTERING IMITATORS!)



PARTIALLY ASSEMBLED KITS For All Sockets Installed And Soldered Add \$50. (Not For Blank PCB)



WANT MORE INFO?
Full Documentation and
Schematics — \$5.

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big Board may just be one of the most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M\*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

**FULLY SOCKETED!** 

FEATURES: (Remember, all this on one board!)

\$31900 (64K KIT BASIC I/O)

SIZE: 81/2 x 133/4 IN. SAME AS AN 8 IN. DRIVE. REQUIRES: +5V @ 3 AMPS + - 12V @ .5 AMPS.

#### 64K RAM

Uses Industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

#### **Z-80 CPU**

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs  $8080 \ \text{software}.$ 

# SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: \$39.95

# BASIC I/O

Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

# BLANK PC BOARD - \$119

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

# 24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case.

# FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch discdrives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M\* 2.2.

## TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. Uses selectable hand shake polarity. Set of all parts and connectors for parallel I/O: \$19.95

# REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: \$9.95

# CP/M\* 2.2 FOR BIG BOARD

The popular CP/M\* D.O.S. to run on Big Board is available for \$139.00.

## BIG BOARD SOFTWARE SPECIAL — \$149

Through special arrangement with CDL we offer a powerful package of TDL Z-80 software that has a suggested retail of almost \$600. Includes: Extended Disk Business Basic, ZEDIT text editor, MACRO II Macro Assembler, LINKER, DEBUG I and DEBUG II. Supplied on 8 in. diskette with extensive manual.

# PFM 3.3 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, BootCP/M\*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

# **Digital Research Computers**

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

**TERMS:** Shipments will be made approximately 3 to 6 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a \$75 deposit. Balance UPS COD. Add \$4.00 shipping.

USA AND CANADA ONLY



of quality. Dealer inquiries invited.

Call Toll Free 1-800-237-8931. In Florida, call 813-577-2794.



Circle 403 on inquiry card.

# C LANGUAGE **PROGRAMMERS**

c-systems C CÓMPILER

c-window<sup>™</sup> Now with:

The first c language source level program testing and debugging tool.

- Single step by c source line.
- Set breakpoints at line numbers.
- Display and alter variables by symbol name, using c expression syntax.
- No more printf or assembler level debuggingl

**c-window**<sup>TM</sup> is a support package for the c-systems C COMPILER for 8086/8088 based systems.

Contact:

c-systems P.O. Box 3253 Fullerton, CA 92634 714-637-5362

TM c-systems

Circle 66 on inquiry card.

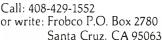
# **GAME DESIGNER**

# HAVE YOU HEARD ABOUT THE FROB

The Game Development System For the Atari® VCS™ Now Available for the Atari 5200 HES™

It allows just about anyone the opportunity to design home video cartridges for the Atari game consoles.

# The Miracle of Creation Communication Can be Yours™



# LOOKING AT PRINTER BUFFERS



BE CERTAIN...

YOU GET WHAT YOU THINK YOU'RE GETTING:

SPOOL-Z-Q is THE

COMPLETE, NOTHING ELSE TO BUY, STAND ALONE PARALLEL PRINTER **BUFFER PLUS FEATURES NOTFOUND ON** OTHER BUFFERS SUCH AS:

- SWITCH SELECTABLE "PAUSE ON FORM FEED" MODE, FOR SINGLE SHEET PRINTING
- AUTOMATICS PACE CHARACTER COMPRESSION
- AUTOMATICS PACE CHARACTER COMPYTESSION

  32K CHARACTERS CAPACITY STANDARD, BAK AND 128K MODELS AVARABLE.
  USER EXPANDABLE
  NO HAROWARE OR SOFTWARE MODIFICATIONS REQUIRED
- AND MUCH MORE WRITE OR CALL FOR FULL DETAILS.



JVB ELECTRONICS 1601 Fulton Avenue, Suite 1 Sacramento, California 95825 Phone: (916) 483-0709

Circle 223 on inquiry card.

# Atlantic Cabinet Computer Furniture



- A complete range of quality work stations designed specifically to house all micro-

- designed specifically to house all micro-computers.

  Delivered heavily packed, in self-assembly form needing only a Phillips screwdriver and a few minutes of your time to assemble. Manufactured from 1" all wood particle board surfaced with hard-wearing melamine veneer, in Oak or Walnut.

  Dealer and Distributor inquiries welcome. For more information, contact your local dealer, write or call Atlantic Cabinet (301) 223-8900.

ATLANTIC CABINET CORPORATION

P.O. Box 100, Williamsport, Maryland 21795

Circle 37 on inquiry card.

# SYSTEM/Z'S BASIC/Z

A New COMPILED Basic for CP/M or MDOS

- No Royalties No Run-time Charges
- No Royalities No Roin-Little Challes Generates machine code (8080/280) Sort Verb 2000 elements in 2 seconds Alpha-numeric Labels Chain with Common BCD Floating Point Math to 18 Digits

- BCD Floating Point Math to 18 Digits Editor Tests Syntax AS You Type Recursive, Multi-line, User Functions Dynamically Dimension Arrays Selectively Erase Arrays Trace and Single-Step debugging Multi-tiered Error Trapping Cursor Addressing, Reverse and Blinking Video

Want to seehow it works? Get DAMAN's Mail-List program for \$30. BASIC/Z run-time packages are included.

Just want further info? Call or write for free BASIC/Z brochure and mini-manual

BASIC/Z lists for \$345, but from DAMAN it's: \$312 Post Paid to North America VISA and Master Card Accepted, COD available or \$298 with cash discount (cash, check, money order)

Add 57 for airmail shipment outside N. America Specify 8". Microp / Vector Graphic, Apple, Osborne, NEC, N. Star Full BASIC/Z Documentation \$35 (Credited to full order)

3322Mem. Parkway, S.W.



(205) 883-8113 Huntsville, Alabama 35801 special bonus disk FREE — over 260 programs for \$179.95 + shipping. For best value, get all 8 disks for \$349, postage prepaid, for over 530 of our best programs at 65¢ each! Call now toll free: 1-800-327-8664

NEW! The Apple users group software library bonanza

at truly affordable prices. For the first time

enjoy your Apple to its fullest capacity using specially packed disks with over 60

outstanding programs each. Not available from any other source!

An extensive variety of interesting, useful and entertaining programs

indispensable to the serious computeris

PROGRAMS APPLEWARE INC. offers

Educational

Library disks 1, 2 & 3 are mixed categories and new

disks 4 (Games), 5 (Utilities), 6 (Graphics) & 7 (Integer at \$59.95 each. Why pay more?

Music Data Base

Order direct from this ad and \$ave up to \$136.

Buy disk library package 1, 2 & 3 and get a

including:

Florida: 1-305-987-8665 6400 Hayes St. Hollywood, FL 33024

Rusiness

Graphics

Science Finance

Circle 27 on inquiry card.

# DISCOUNT DRIVES

Apple II Disk Drives . . . . . . . . . \$285.00 Controller ...... \$90.00 Tandon TM100-2 51/4" d/s TRS-80..... Tandon TM100-4 51/4" d/s Zenith....\$319.00 Tandon TM848-1 8"...\$355.00 Tandon TM848-2 8" . . . . . . \$417.00 thinline d/s... Tandon TM603 10 MB Wini....\$899.00 Tandon TM603E 14.2 MB Wini.....\$995.00 SASI Interface......\$125.00 Xebec Controller.....\$349.00

Elephant floppy disks ss/sd \$17.95 (box of 10) "ALL floopies discounted & 100% guaranteed"

# WHOLESALE SUPPLIERS

DIv. B.O.S.S. Inc.

P.O. Box 22428 Carmel, CA 93922 Call (408) 373-0320

Circle 435 on inquiry card.

# **Get Smart!**



# Get Your Computer An **Automatic Port Selector** (ASU-3)

Our ASU-3 will connect your CPU or CRT to any one of 3 peripherals. Just enter a command from your keyboard and the desired peripheral is automatically connected. Also available for 5 and for peripherals. The baud rate is set automatically Many options are available. The only low cost, smart switch on the market.

#### SWITCH TO GILTRONIX.



970 San Antonio Rd., Palo Alto, CA 94306. Call (415) 493-1300

FRANKLINO

Hardware and software

compatible w/Apple® II plus™ 64K RAM, Upper & lower case, 12-key numeric keypad, Built-in fan, Type-

writer style keyboard

**ACE 1000** 



#### IBM® PC OUTFIT

System uit with 64K, 2 double-sided doubledensity Disk Drive 640K, Monochrome display & printeradapter, DOS, Disk Drive controller

Call or Write

# **SOFTWARE & ACCES.**

| SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | SOFT WAKE & | printer card......QUADRAM 129 95 QUAD Board 64K. QUAD Board 256K 449.00

MICROSOFT RAM Card 64K . 279.95 256K . 629.95 VISICALC/256K . . . 185.00 SUPERCALC . . . . . . 209.95 . 209.95 . 239.95 . 184.95 . 239.95 VISITREND/VISIPLOT

CURTIS PC Pedestal for Monochrome Display... 69.95
POWER TEXT Word Proc299.95
PEECH TREE Accounting
GL, AP&AR 3-pk ...... 469.00 Franklin ACE 1000 64K, Disk Drive with Controller, 12" Hi Res Green Monitor, ACE writer 1 year extended warranty Call or Write

Apple II® plus 64K Super Outfit

Apple II® plus 48K, 16K memory expansion card, Apple disk drive II with interface DOS 3.3, Apple III 12" monitor, Apple writer,

Apple monitor stand 101 ready-to-run programs,

- PLUS: -You get these FREE softwares, Apple Stellar Invaders Value \$2900

Olympic Decathalon Value \$3500

Only \$177999 1 year extended warranty

# apple®



#### WORD PROCESSOR SYSTEM

Apple II plus 48K, 16K mem. expansion, Apple Disk Dr. w/interface DOS 3.3, 12" Hi Res Green Monitor, OKIDATA 80 Printer, Interface Card & Cable, Screenwriter II

Only \$224900

# SOFTWARE & ACCESSORIES FOR APPLE $^{f g}$ and FRANKLIN $^{f g}$

RANA Elite 1 Disc Drive, 15% more storage than Apples' w/controller . . . . Only \$40950

MICRO SCI A-2 Disc Drive, the cost effective alternative to the Disc II, with controller . . . . Only \$38995 without controller .........Only 299.95

KENSINGTON

System Saver Fan, with built-in surge protec-

MICRO PRO Special Offer! Word Pack Includes WordStar, Mail Merge, and SpellStar ..... All 3 for Only \$32900

**NOVATION** Apple Cat II, direct line modemOnly \$29995 Apple Cat II, 212 Upgrade ... Only \$32995

Auto Cat 1200 ..................Only \$58995 Apple is a registered trademark of Apple Computer, Inc. **VISICORP PROGRAMS** 

 Visicalc
 \$18495
 Visifile
 \$18495

 Visiplot
 \$23995
 Visiterm
 \$7995

 Visidex
 \$18495
 Visisterm
 \$23995

 Visidex
 \$18495
 Visischedule
 \$23995

 Desktop Plan II
 \$19495
 \$19495

ADDITIONAL "ADD-ONS"

DC HAYES Micromodem II ..... \$28495 VIDEX Keyboard Enhancer | ..... \$11995 VIDEX Videoterm 80 Col. Board . . . . \$25985 VIDEX Function Strip (fluse w/Enhancer II) . \$6295 TKC Numeric Keypad (Apple only) ... \$13485 ABT Numeric Keypad (Apple only) ... \$9985 THUNDERCLOCK PLUS .\$11985 PKASO Parallel interface ...... \$13495 MICROSOFT Z-80 CP/M Card .... \$24995 MICROSOFT 16K Ram Card ...... \$8995 TG Joystick \$4750 KRAFT Joystick \$4495

VOTRAX TYPE-N-TALK
Lets your computer talk to you Only \$199\*5
Available for Apple/Franklin/Atari/VIC-20

**NEW! APPLI CARD** Z-80 Card w/64K RAM 4 mhz . Only \$34995

FORMAT II WORD PROCESSOR with mail list, user friendly . . . Only \$19995 MICROSOFT PREMIUM PACK

Z-80 CPM Card, VIDEX Videoterm 80 Col. board. CPM user's guide & MICROSOFT RAM Card

All for only \$50995
Plus you receive a FREE Videx Soft Switch (a\*30 Value!)

MICROBUFFER II by Practical Peripherals 32K...Only \$249°5 16K...Only \$214°5

MICROBUFFER for EPSON

16K Parallel . \$13495 8K Serial . \$13495 Franklin ACE is a trademark of Franklin Computer Co.

## **COMPUTER SPECIALS!**

TEXAS INSTRUMENTS
TI 99 4/A with RF Modulator ... \$199°5
After Mfg's Cash Rebate, Plus 2 FREE
ofters from TI Call or Write for details!

COMMODORE
VIC-20 with RF Modulator ... \$177°
RCA VP-3501 built-in modem ... \$329°
ATARI 400 ... Call
TIMEX Sinclair 1000 ... \$89°
48 K Memory ... 49.95 ... 32K Memory ... 99.95

SHARP (Handheld)
PC-1500 with CE-150 Printer ... \$299\*8
PC-1211 with CE-122 Printer ... \$109\*8

ATARI

WORD PROCESSOR

Atari 800 48K, Atari 810 Disk

Drive, Atari Word Processor, 850

Interface, Okidata Microline 82A Printer with Connecting Cables

Call or Write

Atari 800 48K complete with

a 13" color TV

Call or Write

# PACKARD

HP-83A ...... \$1149<sup>95</sup> HP-85A ..... \$2099\*\* HP-87A w/128K ... \$239495 HP-87 XM ..... \$249595 HP-125 ..... \$209985

**HP Accessories** 82901M 51/4" Dual \*169495 Disc Drive ... 82905A Serial Printer\*619\*\* HP-7470A Graphics plotter also avail. in Serial f/Apple® Franklin® and IBM® \$119500

# – PRINTERS

#### NEC

New! 3550 Letter quality printer for IBM PC, Auto proportional spacing, Bidirectional, Bold & shadow printing. Justifica-Parallel, Bidirectional, Tractor & friction High resolution graphics ...... 514.95

SMITH CORONA TP-1 Letter quality Daisy wheel printer. Serial or Parallel interface, 120 words per minute . . . . . 629.00

OKIDATA

MICROLINE 82A 120 CPS, Bidirectional, Parallel-Serial, 80/132 Columns, Friction & 429.95 MICROLINE 83A F/T 120 CPS, Bidirectional, 136 Columns, Serial/Parallel. Friction and Tractor ..... 684.95 **EPSON** 

MX-80 III F/T 80-136 Column Dot Matrix, Tractor or Friction Feed, Bidirecional, 80 CPS, Graftrax Plus ...... Cal MX-100IIIF/T 136-233 Column, Tractor or Friction Feed, Bidirectional, 80 CPS, Graftrax Plus .....Call

**MONITORS** 

USI PI-2 12" High Res. Green . 159.00
USI PI-3 12" High Res. Amber . 189.00
AMDEK 300 12" Green . 149.95
AMDEK 13" Color I . 329.00
AMDEK Color II RGB High Res. . 699.95
AMDEK Color Interface Board f/RGB . . . .

ECM-1302-1 13" RGB Monitor Hi-Res. with NTSC Interface ... 399.95 1302-2 High Res. RGB ... 599.95 COLOR BOARD for APPLE<sup>§</sup> II ... 199.95

CORPORATE ACCOUNTS WELCOME

## DISKETTE SPECIALS!

(10 pk except where indicated) MAXELL MD-1 SS 5 ¼" ... ... 34.95 MAXELL MD-2 DS/DD 5 ¼" ... ... 49.95 MAXELL MD-2 DS/DD 5 % ... 49.95
MAXELL FD-2 DS/DD 8" (Soft Sector)59.95
VERBATIM SS/DD 5 % ... 31.95
VERBATIM DS/DD 5 % ... 46.50
MEMOREX SS/DD 5 % ... 23.95 CONTROL DATA SS/DD 51/4" (12 pk)25.95 

For quantity discount prices please call or write!



With Wordstar, Mailmerge, Supercalc, C Basic and M Basic

Call for Low Price!

Software & Accessories

X-MON monitor adapter . . . . CENTRONIX printer cable . 59.95 Keyboard extender cable 4 ft. RS232 Serial cable ...... 49.95

Games for Osborne 20.00 Star Trek 15.00 Catacomb Trapper

15 00



A Division of 47st. Photo Inc.



AMERICAN

**TOLL FREE OUT-OF-STATE** MERICAN

67 West 47th Street, New York, N.Y. 10036

115 West 45th Street, New York, N.Y. 10036

MAIL ORDER ADDRESS: 36 E. 19th Str. New York, N.Y. 10003

ible for typographical errors. This ad supposed to all attacks of the control 
(212) 260 - 4410

Items on sale for limited time only, and are subject to limited availability. Not responsible for typographical errors. This ad supersedes all other ads prior to Feb. 1983 Prices effective as of Dec. 22, 1982, and are subject to change without notice. All orders subject to verification and acceptance. Minimum shipping and handling \$4.95.

# Four (as in Quad) Function **IBM PC Board**



- Up to 256KB of Parity Memory
- Async Communication Port
- Clock-Calendar with Battery Back-up
- Allows Full 1 Megabyte Addressing
- One Year Warranty
- Parallel Port can be added for an extra \$50
- Free Software Super Disk and Super Spooler

**ORDER** 64K . . \$359 128K . . . . . . \$419 **TOLL FREE** 192K . . . . . . \$469 FREE SHIPPING 256K . . . . . . \$569

> (800) 531-5475 (if outside of Texas) (512) 250-1523 (if in Texas)

> > CompuAdd Corp.

13010 Research Blvd. No. 21B Austin Texas 78750

Circle 86 on inquiry card.

# 51/4" Tandon Drives

\$189 • TM 100-1 (single sided, 40 TRK, single or double density) Free Shipping

\$259 TM 100-2 (double sided, 40 TRK/side single or double density) Free Shipping

\$349 TM 100-4 (double sided, 80 TRK/side Free 96 TPI, double density) Shipping

ORDER - TOLL FREE

1-800-531-5475 (If outside of Texas) (512) 250-1523 (If inside of Texas)

"If we can't ship the next working day, we won't take the order."

Master Card/Visa or check Texas Residents add 5% sales tax

# CompuAdd Corp.

13010 Research Blvd - #218 Austin, Texas 78750

Circle 87 on Inquiry card.



Circle 88 on inquiry card.

# **verbatim**°

Floppy Discs CALL NOW - TOLL FREE 1-800-328-DISC

Dealer inquiries invited. C.O.D.'s and charge cards accepted.

All orders shipped from stock, within 24 hours. Call toll FREE.



North Hills Corporation 3564 Rolling View Dr.

White Bear Lake, MN 55110 1-800-328-DISC MN Call Collect 1-612-770-0485

Circle 302 on inquiry card.

# **ELIZA IS HERE!**

Created at MIT in 1966. ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA is a non-directive psychotherapist who analyzes each statement as you type it in and then responds with her own comment or question — and her remarks are often startlingly appropriate!

Designed to run on a large mainframe, ELIZA has hitherto been unavailable to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so lascinating.

Now. our new microcomputer version possessing the FULL power and range of expression of the original is being offered at the introductory price solony SS. And if you want to find out how she does it (or teach her to do more) will include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for only SSO and include the complete Source Program for the 
Order your copy of ELIZAtoday and you'll never again wonder how to respond when you hear someone say "Okay, let's see what this computer of yours can actually do!"

# ELIZA IS AVAILABLE IN THE FOLLOWING DISK FORMATS:

- Standard 8 inch single density for all CP/M based computers \$25 for ELIZA COM add \$20 for Microsoft BASIC-80 Source
- 5'-a inch CP/Mfor Apple II equipped with Z-80 SoftCard \$25 for ELIZA COM and \$20 for Microsoft BASIC-80 Source

- \$25 for ELIZA-COM aod \$20 for Microsoft BASIC 80 Source \$5 · Inch for 484 Apple It with Applest ROM and 00S 3 3 \$25 for Protected File add \$20 for Applesoft Source \$7 · Inch for 64 KiBM Personal Computer \$25 for Protected File add \$20 for IBM Disk BASIC Source \$5 · Inch for Osborne I Microcomputer \$25 for Protected File add \$20 for IBM Disk BASIC Source \$25 for Protected File add \$20 for Microsoft BASIC-80 Source

#### ARTIFICIAL INTELLIGENCE RESEARCH GROUP

921 NORTH LA JOLLA AVENUE LOS ANGELES, CALIFORNIA 90046 (213) 656-7368 (213) 654-2214 MC. VISA and CHECKS ACCEPTED

Circle 32 on inquiry card.



When it comes to Flexible Disks, nobody does it better than Wabash.

MasterCard. Visa Accepted. Call Free: (800) 235-4137



Circle 318 on inquiry card.



**CONVERSION MODULES** 

SOFTWARE **GAIN CONTROL** 

l differential — 16-channel — analog to digital rocy — programmable gain instrumentation — custom board test — 5-100 — 2 to 15 khz on time — mixable high and low inputs — agin 1024 — 12-bit — sample and hald ampliffer at differential — 16-channel — analog to digital viracy — programmable gain instrumentation — custom board test — \$100 — 2 to 15 khz

For additional details about the AD-100-4 and other fine California Data Corporation 100% individually tested, high reliability products, circle the reader service card number below or for faster response

**CALIFORNIA DATA** 

CORPORATION
3475 Old Conejo Road, Sulte C-10
Newbury Park, CA 91320

(805) 498-3651

# IBM®PC SOFTWARE

FORTH-32TM allow

FORTH-32<sup>TM</sup> allows access to all of the PC memory using intermixed 16/32 bit addressing Screen editor, assembler, decompiler, debug, graphics, CASE, and DOS interface. Package Builder Little; Produces compact marketable software. \$15.0. Floating Point Library (Software or 8087). \$50.

QUESTalk™ Asynchronous

Communications connects your PC to other computers. Menu driven with help feature, terminal or local mode, UPLOAD/DOWNLOAD file transfers. Multiple BAUD rates. \$45.

PrintPak<sup>TM</sup> allows customized printouts via menu driven selection of page headers, line numbe character type, time, date and more \$45

DiskPak<sup>TM</sup> recovers erased files, proviews and modifies sectors and more \$35.

Edlin Recovery Utility reclaims

IBM IS A REGISTERED TRADEMARKOF IBM CORPORATION FORTH-32 QUESTIDAN PRINTPAK DISAPACK ARE TRADEMARKS OF OR



QUEST RESEARCH, INC

■ Huntsville. AL 35804 ■ 205-533-9405 **■ Toll Free 800-558-8088** 

# EDGE-86 AN INDUSTRIAL QUALITY 8086 OEM SYSTEM HARDWARE A Multibus® COMPATIBLE 8086 CPU BOARD WITH DMA FLOPPY CONTROLLER, INTERRUPT CONTROLLER, PROGRAMMABLE TIMERS, 3 SERIAL PORTS, TWO PARALLEL I/O PORTS, AND 8K BYTES OF PROM WITH BOOT STRAP LOADER FOR CPM86TM. 128K BYTES DYNAMIC RAM BOARD. 4-SLOT MULTIBUS CARD CAGE, WITH COMPLETE DOCUMENTATION AND SCHEMATICS, ALL FOR. SOFT WARE CPM/86O.S.WITH COMPLETE UTILITIES...\$250. CPM/86 O.S.WITH COMPLETE UTILITIES . . . \$250. -OFF THE SHELF DELIVERY ■DGE MICRO SYSTEMS 195 W. EL CAMINO REAL, SUNNYVALE, CA 94086 TELEPHONE: 408-738-4729

\* Multibus TM of Intel, TMCPM/86 TM of Digital Research.

# We Have It!.. Computers, Disk Systems, Printers and Terminals

Call For Super Value On S-100 System With Dbl. Dens. 8"Drives!

# INTERTEC SUPERBRAIN II FREE MicroSoft Basic 80.

Self contained computer with dual disks and two SR232C ports, complete with CP/M® 2.2

| 64K Jr                | \$2099 |
|-----------------------|--------|
| 64K QD                | \$2495 |
| 64K SD                | \$2949 |
| 10 Meg. DDS Hard Disk | \$2995 |

#### **VIDEO TERMINALS**

| SOROC IQ 120                   | 595  |
|--------------------------------|------|
| SOROC IQ 130                   | 595  |
| HAZELTINE ESPRIT               | Call |
| HAZELTINE ESPRIT II            | Call |
| HAZELTINE 1420                 | Call |
| HAZELTINE 1500                 |      |
| HAZELTINE 1510                 | Call |
| HAZELTINE 1520                 |      |
| TELEVIDEO 910C                 |      |
| TELEVIDEO 912C                 |      |
| TELEVIDEO 920C                 |      |
| TELEVIDEO 925C                 |      |
| TELEVIDEO 950C                 |      |
| TEXAS INSTRUMENTS 940 Basic \$ |      |
| TI 940 Package                 |      |
| TI 745 Portable Terminal       |      |
| INTERTEC INTERTUBE III         |      |
| ZENITH Z19                     | 729  |

## **PRINTERS**

| ANADEX DP-9001A \$136                       | ງຯ |
|---------------------------------------------|----|
| ANADEX DP-9501A142                          | 29 |
| PAPER TIGER IDS-445G Special! 59            | 99 |
| PRISM PRINTER IDS-80 w/o color 114          | 19 |
| PRISM PRINTER IDS-80 w/color 149            | 99 |
| PRISM PRINTER IDS-132 w/color 169           | 95 |
| NEC 3510 RO, RS232C, 35 CPS Now 161         | 19 |
| NEC 3530 RO, Cent. Inter., 35 CPS. Only 185 | 59 |
| NEC 7710 RO, RS232C, 55CPS 237              | 75 |
| NEC 7720 KSR, RS232C, 55CPS 279             | 95 |
| NEC 7730 RO, Cent. Inter., 55CPS 237        | 75 |
| QUME SPRINT 9/45                            |    |
| Ltd. or Full, 45CPS, RS232C, Now 199        | 98 |
|                                             |    |

| C. ITOH PRO WTITER, Parallel         | . 54  |
|--------------------------------------|-------|
| C.ITOH PRO WRITER, Ser. & Par        | . 64  |
| <b>DIABLO 620</b> RO, RS232C, 20 CPS | 1249  |
| <b>DIABLO 630</b> RO, RS232C, 55CPS  | 229   |
| CENTRONICS 730-1 Par New Low         | 299   |
| CENTRONICS 737-3 RS232C              | . 389 |
| CENTRONICS 704-11 Parallel           | 1699  |
| <b>CENTRONICS 704-9 RS232C</b>       | 159   |
| CENTRONICS 122G Parallel, 120CPS.    | . 949 |
| EPSON MX-80                          | . 489 |
| EPSON MX-80FT                        | . 589 |
| EPSON MX-100FT                       | . 789 |
| EPSON RS232 Serial Interface         | 6     |
| EPSON RS232/2K Buffer Interface      | . 129 |

| EPOUN MY - OUT                            | 30  |
|-------------------------------------------|-----|
| EPSON MX-100FT                            | 78  |
| EPSON RS232 Serial Interface              | 6   |
| EPSON RS232/2K Buffer Interface           | 12  |
| EPSON GRAFTRAX II                         | 9   |
| EPSON Apple® Printer Interface            | . 7 |
| TEXAS INSTRUMENTS TI 810 Basic, 13        | 34  |
| TI-810 Basic RS232C & Parallel 13         | 39  |
| TI-810 w/full ASCII, Vert. forms control, |     |
| compressed print                          | 59  |
| TI-820 RO Basic                           |     |
| TI-820 KSR Basic 19                       | 22  |

# MONITORS

| ZENITH ZYM-121, 12" Green Phos 115  |
|-------------------------------------|
| AMDEK 100 12" New Low! 99           |
| AMDEK 100G 12"Gr. Phos 149          |
| AMDEK 300 12"High Res 179           |
| AMDEK COLOR-1, 13"                  |
| AMDEK COLOR-II, 13" GRB Hi. Res 755 |
| AMDEK COLOR-III, 13" RGB 419        |
| APPLE® Adapter for RGB              |

# ELODDY DICK CYCTEMC

| LULL I DIOK 9191 EINI9           |       |
|----------------------------------|-------|
| MORROW DISCUS 2D Sng., DD        | 898*  |
| MORROW DUAL DISCUS 2D DD         | 1549* |
| MORROW DISCUS 2 + 2, 2 side, DD. | 1239  |
| MORROW DUAL DISCUS 2+2           | 2139  |
| MORROW DUAL DMA DISCUS 2D.       | 1619  |

# HARD DISK SUBSYSTEMS

| MORROW DESIGNS                      |        |
|-------------------------------------|--------|
| DISCUS M5,5 Meg New Low             | 1559*  |
| DISCUS M 10, 10 Meg                 | 3095   |
| DISCUS M26, 26 Meg                  | 3795   |
| CORVUS 5 Meg                        | . 2379 |
| CORVUS 12 Meg                       |        |
| CORVUS 18 Meg                       |        |
| MAEZON 5 Meg                        | . 1695 |
| MAEZON 10 Meg                       | . 1949 |
| MAEZON 15 Meg                       | . 2799 |
| INTERTEC 10 Meg Special             | 2999   |
| *Includes CP/M®2.2 and MicroSoft Ba | sic.   |
|                                     |        |

| FLOPPY DISK                    |
|--------------------------------|
| CONTROLLER BOARDS              |
| CROMEMCO 16 FDC, DD            |
| NORTH STAR DD479               |
| MORROW DISK JOCKEY 2D, A&T 329 |
| INTERSYSTEMS FDC-2, A&T 439    |
| TARBELL DD, A&T 445            |
| SYSTEMS GROUP DD, DMA 439      |
|                                |

# **ESCON CONVERSION** FOR IBM SELECTRIC

| Complete w/microprocessor controller and power supply. Factory built. User installs |
|-------------------------------------------------------------------------------------|
| solenoid assembly or it can be done at the                                          |
| ESCON factory.                                                                      |
| RS232C Serial & Parallel534                                                         |
| Cable for above                                                                     |

# **PROM PROGRAMMERS**

| SSM PB1 Kit  |  |    |  |    |  |  |  |   |  | 152 |
|--------------|--|----|--|----|--|--|--|---|--|-----|
| SSM PB1, A&T |  | ٠. |  | ٠. |  |  |  | • |  | 225 |

### **MODEMS**

| NOVATION CAT, Acoustic            | 149 |
|-----------------------------------|-----|
| D-CAT, Direct Connect, (300 Baud) | 155 |
| AUTO CAT Auto Answer              | 219 |
| APPLE CAT                         | 329 |
| D-CAT (1200 Baud)                 | 599 |
| 103 JLP Auto Answer               | 219 |
| DC HAYES MICROMODEM II (Apple)    |     |
| HAYES SMART MODEM (300 Baud)      | 239 |
| HAYES SMART MODEM (1200 Baud)     | 595 |
| POTOMAC MICRO MAGIC (S.100)       | 239 |

### **CALIFORNIA COMPUTER SYSTEMS**

| Z80 CPU Board                 | 269   |
|-------------------------------|-------|
| Disk Controller 2422, w/CP/M® | . 359 |
| 16K Static, A&T               | 259   |
| 32K Static, A&T               | 399   |
| 64K Dynamic RAM               | . 335 |
| SYSTÉM 2210 w/64K, CP/M® 2.2  |       |

#### CDLLBUADDS

| OI O BOAILDO                  |   |
|-------------------------------|---|
| (Assembled unless noted)      |   |
| NORTHSTAR Z-80(ZPB, A/A) 26   | 9 |
| INTERSYSTEMS (MPU-80)34       | 9 |
| SSM CB1 8080, A&T             | 4 |
| SSM CB2, Z-80 A&T28           | 9 |
| SSM CB2, Z-80 Kit 21          | 9 |
| SYSTEMS GROUP Z-80 with I/O41 | 9 |

# **MEMORY BOARDS**

| NORTHSTAR 16K RAM   | . 199 |
|---------------------|-------|
| H-RAM64K            | . 589 |
| H-RAM 32K           | . 419 |
| CROMEMCO 16KZ       | . 419 |
| CROMEMCO 64KZ       | . 595 |
| CROMEMCO 256KZ      | 1095  |
| MEMORY MERCHANT     |       |
| 16K Static, 4 MHz   | . 159 |
| 64K Static, 4 MHz   | . 549 |
| SYSTEMS GROUP       |       |
| DM6400, 64K Board   | . 529 |
| DMB6400, 64K Board  |       |
| HDM2800, 128K Board |       |
|                     |       |

| GODBOUT (A&T).          |     |
|-------------------------|-----|
| CPU-Z                   | 249 |
| CPU 8085 88             | 359 |
| RAM 20 32               | 359 |
| RAM 17 64               | 510 |
| RAM 21 1                |     |
| INTERFACE 1             | 215 |
| INTERFACER 1            | 215 |
| INTERFACER 2            |     |
| DISK 1                  |     |
| SYSTEM SUPPORT 1        | 335 |
| ENCLOSURE 2 (Desk)      | 699 |
| ENCLOSURE 2 (RACK)      | 759 |
| VIDEO BOARDS I/O Mapped |     |

# 

| 33W VWZ 1/0, Ad 1                |
|----------------------------------|
| Memory Maped                     |
| SSM VB1C, 16x64, Kit             |
| SSM VB1C, 16x64, A&T             |
| SSM VB3, 80 Char. 4MHz. Kit 359  |
| SSM VB3, 80 Char. 4 MHz, A&T 419 |

# **APPLE® BOARDS**

| CALIFORNIA COMPUTER            |    |
|--------------------------------|----|
| 7710A Asynchronous Ser. Inter  |    |
| 7712A Synchronous Ser. Inter   | 14 |
| 7424A Calender Clock           |    |
| 7728A Centronics Printer Inter | 99 |

# Call for price on MORROW MICRO DECISION and **CROMEMCO SP-10**

We stock a complete inventory of MAXELL, MEMOREX, SCOTCH and VERBATIM for all your Diskette requirements.

Write for free catalog

943 W. Genesee St. P.O. Box 2991 B Syracuse, New York 13220

TWX 710-542-0431



change. All offers subject to withdrawl withment) C O D 's & Credit Cards 2% higher

TI-810 Package w/LQ.



COGITATE Fast Dump/Restore System for TS 802H, 806

· Back-up files twice as fast as PIP

. Double the storage, up to 700K/diskette, with multiple diskette capability \$90.00

COGITATE Type Ahead With Print Screen

Print key prints screen.

· 64 character type a head buffer 590.00

COGITATE 2780/3780 Communications System.

. Communicates with most IBM systems

. Many features for remote job

entry

TurboDOS

\$400.00

• MULTI-USER • SEMINARS

\$750.00 \$250.00

CP/M® is registered trademark of Digital Research, Inc. TurboDOS is a registered trademark of Software 2000. Inc. PLUS OTHER GOOD TELEVICED STUFF!

COGITATE, Inc.

SPECIALISTS IN UNIQUE TELEVIDEO SOFTWARE 24000 Telegraph Road, Southfield, MI 48034 (313) 352-2345

VISA/MASTER CARD Accepted

Circle 76 on inquiry card.

# DISKETTES AND DISKETTE DUPLICATION

DISKETTES (Hub Ring/Write Protect)

Certified 100% error free

Box of 10 54 Single Side/Single Density \$17.50 Single Side/Double Density 20.00 Double Side/Double Density 24.00 8 Single Side/Single Density 20 00 Single Side/Double Density Double Side/Double Density 25.50 30 00

Specify soft, 10 or 16 sector on 5¼ diskettes Shipping \$1.50 (Cal. add tax) Money Order/VISA/MasterCard/C.O.D

- Duplication services all popular formats All services performed on latest technically advanced equipment
- Prices start at \$1.90, including diskette Please write for full description of all Hoffman services and prices.



Circle 197 on inquiry card.



P.O. Box 18, Mountain City, TN 37683



51/4"

Specify soft, 10 or 16 sector Price/10 Price/100 \$185.00 1 side/double density \$20.00 34.50 325.00 2 sided/double density

8" Specify soft Price/100 or 32 sector Price/10 1 side/single density \$21.00 \$195.00 1 side/double density 29.50 275.00 2 sided/double density 34.50 325.00

Certified Check - Money Order - Personal Check Allow up to 2 weeks for personal checks to clear Add \$1.50 to each order for U.P.S. shipping charges. NJ Residents add 5% NJ Sales Tax

EXTHANGE, INC

280 Dukes Parkway, P.O. Box 85 Somerville, N.J. 08876 • (201) 725-6680

Dealer Inquiries Invited

Circle 139 on Inquiry card.

# \$99 SINGLE BOARD COMPUTER/CONTROLLER



-Automatic Baud Rate

-14 Bit Counter/Timer

-Onboard Prototyping

\* 4K RAM or CMOS RAM

-6.144 MHz Crystal -Onboard Expansion

\* 4K ROM &/or

-5 Interrupts

#### MODEL MCG-85 FEATURES:

- -8085A CPU
- –2K System Monitor ROM
- -256 Bytes of RAM -RS232C Port
- -Parallel & Serial I/O -Two 8 Bit Prog Ports -One 6 Bit Prog Port -41/2 × 61/2 PCB

COD accepted.

STOCK \$99 Kit \$135 A&T. Expansion Boards available. Visa, M.C., Amex &

# ATLANTIS COMPUTERS

31-14 Broadway Astoria, N.Y. 11106 212/728-6700

Circle 38 on Inquiry card.

# CALL 8003431078 **FOR THE** BEST PRIC

Call P.R.I.C.E. for big savings on home computers, software, video cassette recorders, car stereo, home stereo, portable radios and tape recorders, cordless telephones, and answering machines, video games, tapes, and movies.

P.R.I.C.E. will be at any legitimate offer on in-stock items. Call our tollfree number now! 800-343-1078. In Mass. 617-961-2400.

67 Teed Dr., B283, Randolph, MA 02368

# 51/4" Floppy Disk Drives

(Direct IBM® Plug-in)

TANDON Model TM 100-1. \$189\* ea. TANDON Model TM 100-2. \$269\* ea. 12" Green Phospher Zenith Monitor \$109° ea.

# IBM EXPANSION **BOARDS**

64K Memory ..... \$275\* ea. 128K Memory ..... \$375\* ea. 192K Memory ..... \$450\* ea. 256K Memory ..... \$510\* ea. Floppy Controller . . . . . . \$180\* ea. 16K System BD Memory . \$ 25\* ea. MC / VISA or C.O.D. with certified check or money order. Arkansas residents add

For information or orders, call

501-777-9859

G-H Computer Systems, Inc. P.O. Box 871 • Hope, AR 71801

\* Plus Shipping.

Circle 179 on inquiry card.

# MicroScript™

Are you wasting valuable time trying to format complex documents with a word processor or obsolete text formatter? obcomers with a word processor of obsolere lext normater. MicroScript<sup>TM</sup> is a state of the art text formatter specifically designed for the production of technical manuals, specifications, and other complex documents. This powerful tool pays for itself the first time you use it. Featuring:

- floating text blocks
  footnotes generalized markup
- left alignment
- center alignment right alignment
- iustification
- left indention
- right indention
- bold text
- underscored text
- proportional spacing fully definable page
- multiple columns headers and footers
- · symbol processing table of contents
   direct printer control initialization profile

variable line spacing
 widow supression

imbedded documents

section numbering

macro processing

· automatic lists

page numbering

\$99 postpaid within U.S., outside U.S. add \$10. CA residents add 6%. Specify CP/M-80\*, CP/M-86\*, MS-DOS\*, or PC-DOS\*; printer type; disk format.

# Software Technique™

6531 Crown Blvd., Suite 3A • San Jose, CA 95120 (408) 997-5026

CP/M-80, CP/M-86 trademarks of Digital Research, MS-DOS trademark of Microsoft, PC-DOS trademark of IBM Corporation.

Circle 390 on Inquiry card.



5¼" disk storage capacity without adding a drive.

Get twice as much from your H88 or H89 microcomputer. Our FDC-880H floppy disk controller, in conjunction with your 5¼" drives, for example, expands memory capacity from 256 bytes to 512 bytes per sector.

And it handles single and doublesided, single and double-density, 8" and 51/4" drives - simultaneously.



C.D.R. Systems

Controlled Data Recording Systems Inc. 7210 Clairmont Mesa Blvd., San Diego, CA 92111 (714) 560-1272

# **FLECTRONICS**

**FULL LINE ALL PARTS & COMPUTER PRODUCTS** 

P.O. Box 4430X Santa Clara, CA 95054 Will calls: 2322 Walsh Ave. (408) 988-1640

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

#### INTEGRATED CIRCUITS

# Phone orders only (800) 538-8196

| 7400 T                                                                                                                                                                                                 | 199999999999999999999999999999999999999 | LANGE   1 29                                                                                                                                                                    | Compared    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CA3045<br>CA3046<br>CA3082<br>CA3082<br>CA3089<br>LM301AN/AH<br>LM307N<br>LM307N<br>LM308N<br>LM311H/N<br>LM317T<br>LM317K<br>LM317K<br>LM317K<br>LM317K<br>LM317K<br>LM317K<br>LM320K-12<br>LM320K-12 | 89<br>1 49<br>1 49<br>1 59<br>32<br>87  | 1344 455 CH464 577 PROM C0444 777 17023 4 59 CH464 255 17023 4 59 CH464 255 2768 7 55 CH464 255 2768 7 55 CH469 255 2768 7 55 CH469 255 1768 1768 1768 1768 1768 1768 1768 1768 | 6116P.2 8 99 PNIDSOS 907 CCCA 500 99 ENIEST 4 4 5 PNIDSOS 907 CCCA 500 90 ENIEST 4 4 5 PNIDSOS 907 CCCA 500 90 ENIESP.2 10 95 PNIDSOS 907 CCCA 500 2 20 ENIESP.2 10 95 PNIDSOS 907 CCCA 500 2 20 ENIESP.2 10 696 ENIESP.2 10 6 |
| LM3201-5<br>LM3201-8<br>LM3201-12                                                                                                                                                                      | 85<br>85                                | 6748 29 95 CD4076 79<br>8755 31.95 CD4078 29<br>N82523 2 95 CD4081 29                                                                                                           | 4110 Zoolis Dyllalliic HAM 8/310:00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Apple Peripheral Kits SERIAL I/O INTERFACE 0 to 30,000 baud. D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) \$14.95, Kit (P/N 2A) \$51.25, Assembled (P/N 2C) \$62.95.

PROTOTYPING BOARD (P/N 7907) \$21.95. PARALLEL TRIAC OUTPUT BOARD 8 triacs each can switch 110V, 6A loads, Bd only (P/N 210) \$19.20, Kit (P/N 210A) \$119.55.

PLE II GAME PADDLES Adam and Eve \$38.00. 16K RAM Board to take you to 64K. Assem. \$67. Kit \$57.

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & -12Vrequired.Bd only (P/N 101) \$11.95, Kit (P/N 101A) \$42.89.

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) \$9.95.
RS-232/20mA INTERFACE Bidirectional, 2

HS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) \$14 95

**PROM Eraser** 

will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity \$37.50 (with timer \$69.50). 6 PROM capacity OSHA/UL version \$83.00 (with timer \$119.00)

## Z80 MicroProfessor \$135.00

Single board computer. Learning, teaching, prototyping. 2K RAM, keyboard, displays; cassette interface. Tiny BASIC **\$19.00**. All fully

# MONTHLY SPECIALS

| 2114<br>2114L3<br>2764<br>280 DMA<br>µPD 765 | 8/\$13.95<br>8/\$14.95<br>\$14.50<br>\$ 9.95<br>\$34.95 | 2732-2<br>4164-150<br>1771<br>1791<br>1793 | \$10.95<br>6.75<br>15.95<br>24.95<br>26.95 |
|----------------------------------------------|---------------------------------------------------------|--------------------------------------------|--------------------------------------------|
| LM317K                                       | \$ 1.50                                                 | 2532                                       | 6.50                                       |
|                                              |                                                         |                                            |                                            |

**Z80 Microcomputer Kit \$69.00**16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board \$28.50. Full Kit \$79.00. Monitor \$20.00. Power Supply Kit \$35.00. Tiny Basic \$30.00

# Modem Kit \$60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only 17.00. Article in June, July, Aug. Radio Electronics, 1981.

**60 Hz Crystal Time Base Kit \$4.40** Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy

Video Modulator Kit Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply 8v 5 amp, ±18v .5 amp, 5v 1.5 amp, -5v .5 amp, 12v .5 amp, -12v option. ±5v, ±12v are regulated. Basic Kit \$35.95. Kit with chassis and all hardware \$51.95. Add \$5.00 shipping. Kit of hardware \$16.00. Woodgrain case \$10.00. \$1.50 shipping

#### Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vo cabulary, built-in text to speech algorithm, 70 100 bits per second speech synthesizer RS232C interface \$275.00. Speech IC \$59.00.

## INTRODUCING A BRAND NEW MICROCOMPUTER

VENTURE is a single hoard computer that is an adventure for the hobbyist. It is a learning, training computer as well as just plain fun for anyone who wants to get into a state-ofthe-art computer at reasonable cost.

VENTURE comes in kit form or fully assembled and tested. You can get it in its

minimum configuration for as little as \$195.00 or take it all the way to floppy disks and voice. It can be expanded as a kit or fully assembled,

at your own pace and choice.

VENTURE is a 16" by 20" main board with separate ASCII and HEX keyboards. It runs fast, the separate ASCII and HEX keyboards. almost 4 MHz, and has the capability of putting 1.5 megabyte of RAM and ROM on the board along with a variety of inexpensive options. A 16-channel analog-to-digital converter al-lows use of joysticks, control functions, in-

strumentation, temperature sensing, etc. T1 sound generator, software controlled music, Votrax voice synthesizer and real time clock calendar add to its versatility.

VENTURE connects directly to a monitor or to your TV set through an RF modulator. And now for the heart of VENTURE...its video display. VENTURE has a high resolution programmable video display with up to 16,384 user-defined characters, alphanumeric symbols, special graphics or objects, such as space ships, etc. Each character is 8 pixels wide by 16 pixels high, with 2 grayscale maps; it has 256 levels of grayscale plus video invert/compliment and hidden screen update for a "snow" free display. The display is 512 x 512 pixel mapped with 2 planes of video RAM per display, VENTURE

video is in short...astounding! VENTURE has complete software support with full BASIC, 3 ROM monitors, disassembler/assembler/editor. It will run real-time video games, all RCA chip 8 programs and all current

**Venture** 

Quest 1802 software. VEN-TURE DOS will accommodate up to four 51/4" double density floppies. A com-plete 1802 programming book is available. All ver-sions of VENTURE are shipped with a set of manuals written to be understood by the inexperienced as well as experienced user.

A standard 60-pin bus with 5 slots, parallel ports and 2 serial ports with full handshaking (75 to 9600BAUD) allow expansion into floppy disks, color, EPROM programmer, printer, model of your choice. Laterexpansion will add a light pen, a universal user programmable music sound board, General Purpose Instrument Bus, and a high resolution color/grayscale pixel mapped video board. On-Board Options

16 channel A to D; 5 slot 60 pin bus, 2 serial ports, parallel ports, 4 video options incl. color, 48K RAM, Votrax voice synthesizer, sound generator, EPROM, full BASIC, disassembler, editor, assembler, metal cabinet, additional power supply, ASCII keyboard real time clock calendar

#### **Expansion Options**

Floppy disk, EPROM programmer, light pen, universal user programmable music, sound board high resolution color/grayscale pixel mapped video board. General Purpose Instrument Bus, 8088 co-processor board.

Minimum VENTURE System \$195.00

Kit includes CPU and control with 4K of RAM, 1K of scratchpad, 2K monitor, 1861 video graphics, cassette interface and separate HEX keyboard with LED displays for address and output. Power supply is included along with 2 game cassettes. The main board is 16" x 20" and includes space for all of the previously discussed on-board options. Full on-board expansion can be completed for under \$1000.00. Call for further details, option prices, etc

# RCA Cosmac 1802 Super Elf Computer \$106.95

The Super Elfis a tremendous value as it combines video, digital displays, LED displays, and music, all on a single board for \$106.95.

The Super Elf expansion capability is virtually unlimited and you can do it inexpensively one step at a time. Expansion includes casstte interface, additional memory, color video, Basic, ASCII keyboard, printer, floppy, S-100 bus, RS232, etc.

The Super Elf comes complete with power supply and detailed 127 page instruction manual which includes over 40 pages of software, including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D. A monthly newsletter. Questdata is devoted exclusively to software for the Super Elf and there are many software books available at low cost. The Super Elf computer system is now available as

a series of bare boards as well as full kits and Bare Boards: Super Elf \$35.00. Super Expansion \$35.00. Power Supply \$10.00. S-100 Color \$35.00. Onmic RAM \$40.00. Manuals \$10.00.

Super Basic \$45.00. "Eat & Run" cassette \$14.95

# Free 14 Page Brochure

Send or call for a free brochure on all details and pricing of the Super Elf and its expansion. We will get it right out to you!

# Voltage Mate \$18.50

\$1.25 shipping. Switching regulator kit with adjustable AC/DC voltage conversion. 3 modes of operation; step up, step down, inversion. Jumper selectable modes of operation. Input voltage 5-15 VDC, output voltage - 24 to + 30 VDC, current draw 30-250 ma

# UHF Preamplifier Kit \$34.95

\$2.00 shipping. Improves uhf reception dramatically, 25 db gain assem. version \$57.50. Articles Radio Elect. Mar, May, 1981

**Fluke Multimeters** 

D800 \$125.—D802 \$189.—D804 \$249.

# Rockwell AIM 65 Computer

6502 based single board with full ASCII key-board and 200 column thermal printer. 20 char. alphanumeric display ROM monitor; fully ex pandable **\$445.00**. 4K version **\$454.00**. 4K Assembler **\$35.00**, 8K Basic Interpreter **\$65.00**.

Special small power supply 5V 2A 24V .5A assem. in frame \$59.00. Molded plastic encloto fit both AIM 65 and power supply \$52.50. AIM 65 1K in cabinet with power sup-ply, switch, fuse, cord assem. \$571.00. 4K \$586.00. A65/40-5000 AIM 65/40 w/16K RAM and monitor \$1295.00. RAM Board Kit (16K, \$195) (32K, \$215). VD640 Video Interface Kit \$119.00. A&T \$149.00. Complete AIM 65 in thin briefcase with power supply \$532.00. Special Package Price: 4K AIM, 8K Basic, power

supply, cabinet \$615.00.
AIM 65/KIM/SYM/Super Elf 44 pin expansion board: board with 3 connectors \$22.95. \*Send for complete list of all AIM products.

# Elf II Adapter Kit \$24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional \$18.00.

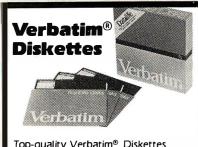


# Super Color S-100 Video Kit \$99.00 Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. Dealers: Send for excellent pricing/margin

TERMS: \$5.00 min. order U.S. Funds. Calif. residents add 6% tax. \$10.00 min. VISA and MasterCard accepted. \$1.00 insurance optional. Shipping: Add 5%; orders under \$25.00—10%.

**Prices** to change

FREE: Send for your copy of our 1982 QUEST CATALOG. Include 88¢ stamp.



Top-quality Verbatim® Diskettes from Tech Data, your complete word and data processing supply center. Dealer inquiries invited.

> **Call Toll Free** 1-800-237-8931. in Florida, call 813-577-2794.



Circle 404 on inquiry card.



Wasting Money! We Have the World's Most Cost Effective Development System.



- Includes Hexkit 1.0, a powerful 100% machine code editor/ debugger utility program that makes coding for 8-bit Micros a
- Program from Commodore VIC-20 keyboard into built-in 4K ROM emulator
- Jumper to target ROM socket
- Test programs in circuit
  Built-in EPROM programmer
- and power supply Burns & runs EPROMS for the Commodore VIC-20, too
- Comprehensive manuals
- Fits EXPANSION PORT

PROMQUEEN CARTRIDGE ONLY \$199

Send for Free Brochure

# Gloucester Computer Bus Co.

6 Brooks Rd., Gloucester, MA 01930 617-283-7719

VISA AND MASTERCARD ACCEPTED

C commodore approved product

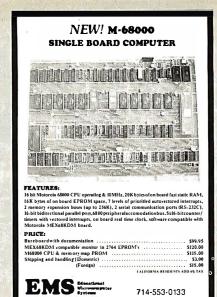
Circle 187 on Inquiry card.





WIREMASTER is a software tool for design, layout, and assembly of hardware. Your schematic is fed to WIREMASTER, which produces network maps, cross-references, wire and parts lists, and debug checklists. CHANGEMASTER keeps track of fixes and updates. PLOTBOARD and PRINTBOARD give pictures of the layout. Post-processors for wirewrap machines available. Runs on 8 and 16 bit CP/M, CDOS, and MSDOS. \$200.

AFTERTHOUGHT ENGINEERING 7266 Courtney Dr., San Diego, CA 92111, (714) 279-2868.



Circle 162 on Inquiry card.



General Sort and Merge Utility Created exclusively for the IBM Personal Computer \$95

714-553-0133

#### THE SORT SORTS:

- BASIC, PASCAL, FORTRAN COBOL and MailMerge files
   sequential, random files
   records organized by items and lines

- for all common data types (string-text, integer, real. double precision)
   for all common data types (string-text, integer, real. double precision)
- integer, real, double precision)

  external and internal data
- representations
- interactive parameter preparation
- record selection
  Requires 48 K and one disk drive

# Also OMS SOFTWARE DEVELOPMENT SERIES

A. PASCAL SCREEN UNIT - Access screen and keyboard from Pascal program - \$40

B. PASCAL DOUBLE PRECISION ARITHMETIC PACKAGE · Increase your Pascal integer arithmetic precision to 32 bits! · \$40

C. UTILITY PACKAGE - converts video modes, opens communication lines, speeds up I/0, Sets Epson and NEC tabs · \$25
\*Registered trademark of IBM.

Send order with check/money order to ORGANIZATIONAL MANAGEMENT SYSTEMS, INC. 3 Chickory Court, Glen Arm, Md. 21057 (301) 668-9011

MD residents include 5% sales tax

Circle 311 on inquiry card.

# S-100 Single Board WINCHESTER

"FASY DISK CONTROLLER"

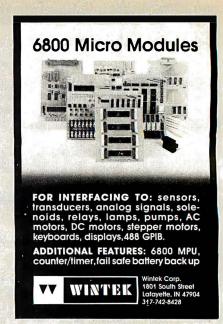


- Works with any S-100 CPU + IEE 696
- Supports 51/4", 8" and 14" Drives ST-506, SA-1000, SA-4000 Interfaces
- Record Accessible 1-K sector buffer frees host memory, matches DMA speed
- On-board microprocessor auto seeks, simple, very small software driver
- Dealers and Distributors invited

Assembled and tested with formatter/test program and operating system drivers. VISA, MasterCard - specify drive - \$545.

Monitor Dynamics, Inc. 1121 West Ninth St. • Upland, CA 91786 (714) 985-7214

Circle 286 on Inquiry card.



Circle 438 on Inquiry card.

# Get more out of your Apple with the MICRO on the Apple Series

Vols. 1, 2, & 3 \$24.95 ea.

+ \$2.00 shipping each volume

Each book includes more than 30 programs -

all on DISKETTE

Machine Language Aids I/O Enhancements **Runtime Utilities Graphics & Games** Hardware & Reference

Information

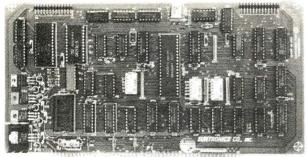
To order toll free:

1-800-345-8112 In PA 1-800-662-2444

MICRO INK, Inc. P.O. Box 6502 Chelmsford, MA 01824

Circle 257 on inquiry card.





# SBC-880 S-100 IEEE STAND ALONE SINGLE BOARD COMPUTER

USES Z-80A (2 or 4MHz)

FEATURES: RS232 Serial I/O Port ● Parallel Ports for Centronics or Gen Purpose Printer • Three 16 bit Programmable Timers, one used for baudrate • EPROM Circuitry for 2708, 2716, or 6116 (2K RAM) • 1K On Board RAM Circuitry locatable on 1K boundries Power On EPROM Jump Circuitry
 Phantom EPROM Circuitry

\$265

APPLE II COMPATIBLE

FLOPPY DISC CONTROLLER DIRECTLY DRIVES ANY ANSI. SHUGART OR TANDON DISK DRIVES

# FDC-1 S-100 IEEE 696 FLOPPY DISC

FEATURES: State of the art digital separator • Drives can be any ANSI 51/4" or 8" drive • Drive Size, Step Rates, Formats can be intermixed without changing software • Runs SD, DD, SS and DS Formats • Digital Prewrite Compensation.

Assembled and Tested . . . . . . . . \$295.00 Kit . . . . . . . . \$265.00

# REAL TIME **CLOCK CALENDAR**

S-100 IEEE

**GIVE YOUR COMPUTER THE** Hour-Min.-Sec.-Day-Month-Year

FEATURES: Date provided as Day, Month, Year with Leap Year register bit • Time provided as 12 or 24 hour program selectable format, hours, minutes and seconds • Time and Date settable by program control ● Plus or Minus 30 second time adjustment ● 4 Time Interupts available - 1 hour, 1 minute, 1 second and 1040Hz (approx. 1 millisecond) ◆ Crystal Controlled time reference
 ◆ On board Rechargable Data Sentry Battery 

# APPLE II COMPATIBLE ASCII



FEATURES: N-Key Rollover Function ● Shift lock, Underscore and [] / ● High Flexibility for Modification or Expansion ● Plug-ın Compatible with Apple II ● Compact size, mounts in Apple II Case • Full Typewriter Keyboard with TTL level ASCII outputs • On-Off Indications 

Low Power Consumption

Assembled and Tested......\$99.00

# S-100 IEEE 696 CARD CAGES AND MOTHER BOARDS

**★**Ground Sheilding Network prevents cross talk

Frees you from Apple disc drives and Apple look alike drives.

FEATURES: Compatible with CP/M, PASCAL and Apple DOS 3.3 ● Drives can be any standard Shugart compatible 5¼ drive ● Reads 13 or 16 Sector Discs, hard or soft sectored

**★LED Power Indicator** 

Tandon, D/D TM100-1.....

**★**Easy Access to Power and Reset Lines

• 7 Cards can be used to drive 14 Disc Drives (two drives each card)

★Available in 6, 8, and 12 slot cages

|                        | 6 Slot  | 8 Slot  | 12 Slot |
|------------------------|---------|---------|---------|
| Bare Board             | \$20.00 | \$25.00 | \$35.00 |
| Kit                    | 40.00   | 55.00   | 80.00   |
| Assembled & Tested     | 55.00   | 80.00   | 115.00  |
| A & T and in Card Cage | 80.00   | 115.00  | 155.00  |

# SUNTRONICS PROTOTYPE BOARDS



APPLE Prototype Board. Double sided glass with gold plated Apple and General Purpose terminals. Contains matrix of 17 x 63 solder plated donuts on .15" x .1" spacing. Great for 14, 16, 24 pin IC's.



S-100 Prototype Board. Double sided glass with gold plated, numbered S-100 terminals. Matrix of 25 x 78 solder plated donuts on .15" x .1" spacing, Locations for headers and regulators. Great for 14, 16, 24 pin IC's.

SUN-721 ..... \$17.85

# General Purpose Experimental Prototype Boards (Solder Plated w/Double Sided Terminals on .156" Centers)



15/30 pin, 31/8 x 41/2 board w/.1"x.2" hole spacing and power strip run every 1.2". Allows 6x7 8pin IC's or 2x3

SUN IC-S......\$1.65

22/44 pin,  $4\frac{1}{2} \times 6\frac{1}{8}$  board w/.1" hole spacing. Contains 4 rows of 67 pins with power strips between rows. Pattern of 4 columns of 67 pins. Takes all sizes of IC's. SUN U-75 .

22/44 pin; 4% x 7 board w/.1" x .2" hole spacing and power strips every 1.2" Allows 10x10 8pin IC's or 3x7 24pin IC's

Dealer Inquires Invited

# EPROM's, RAM's, CPU, and MISC

|      |        | ,           |         | ,,                 |          |       | _     |
|------|--------|-------------|---------|--------------------|----------|-------|-------|
|      | 1-7    | <b>8</b> up | 50 up   |                    | 1-7      | 8 up  | 50 up |
|      |        |             |         | 6116P-3 (150nS)    | 6.10     | 5.75  | CALL  |
| 2732 | 4.75   | 4.40        | CALL    | 2114L-2 (200nS)    |          | 1.62  | CALL  |
| 2532 | 7.65   | 5.95        | CALL    | 4164 (150nS)       | CALL     | CALL  | CALL  |
| 2764 | 16.95  | 14.50       | CALL    | <b>Z-80A</b> CPU   | 5.29     | _     | _     |
|      | 16K RA | M Expa      | nsion K | it For TRS-80 Mode | 111 \$11 | .00/8 |       |



# SAMWOO

Features: Composite Video Input/

Output • Switchable Input Impedance 75 or 10K ohm • 750 Line Resolution at Center and 500 Lines at Corners • Dimensions are 12.13"x11.34"x 11.65" for the 12" model and 8.66" x-8.54"x9.05" for the 9" model

| 9" | 18Mhz | BANDWIDTH |
|----|-------|-----------|
|    |       | 6117.0    |

Black and White . . . . . . \$117.00 .. 125.00

12" 12MHz BANDWIDTH Black and White . . . . . \$127.00 Green . . . . . . . . . . . . . . . 130.00 Orange . . . . . . . . . . . . . . . . . 134.00

Add \$7.50 Shipping and Handling for this item Dealer Inquires Invited



# TRONICS CO., INC.

12621 Crenshaw Blvd., Hawthorne, CA 90250 STORE HOURS: MON -ERI 9:00am to 6:30pm

SATURDAY 10:00am to 5:00pm

CALIFORNIA *213-644-1149*  **OUTSIDE CALIFORNIA TOLL FREE** *1-800-421-5775* 

ifor Tech Info and Calif. orders:

(Order Desk Only)

Mail Order-Minimum Order: \$10. Send Money Order or Check to: P.O. BOX 1957-Dept. B, HAWTHORNE, CA 90250. VISA or Mastercard (please include expiration date). Add \$2.00 postage and handling to order. CA residents add 6% sales tax. Apple is a registered trademark of Apple Computer Inc.

Circle 397 on inquiry card.



Circle 318 on Inquiry card.



Circle 278 on inquiry card.



MediSoft specializes in non-accounting software applications for the medical professional, pharmacy, hospital and teaching institution. Emphasis is on literature retrieval, drug information, pa-tient data processing, diagnostics and biosimulation. We are currently marketing and developing software in these areas. If you are a program designer with medical interests or a medical professional with programming interests, contact us for a prospectus on our future and yours.

# MediSoft



Medical Professions Building 1595 Soquel Drive, Suite 350 Santa Cruz, CA 95065 (408) 476-7861

Circle 250 on inquiry card.

# price or quality?

with a MICRO CONNECTION. the quality, direct connect, Bell 103 modem. Independent reviewer writes, "When the going gets rough, if a MICRO-CONNECTION can't make it, then nothing will. In the area of sensitivity and noise elimination, it will perform as good or better than my \$995" modem. An excellent value for \$159 Autodial/Autoanswer for \$199.

the microperipheral corporation 2643 151 st Place N.E., Redmond, WA 98052



(206) 881-7544



Circle 273 on inquiry card.

# NOW MAKE SOLID CONNECTIONS.... Male or Female

### **RS 232 GENDER REVERSERS**



Order either two male or two female connectors with all 25 pins

interconnected. Both Gender Reversers just \$34.95 postpaid. Purchase Orders from rated firms accepted. Get free illustrated catalog of interface and monitoring equipment.



postpaid

#### electronics

P.O. Box 475-B • Mendota, IL 61342 Phone (815) 539-5827

Circle 43 on inquiry card.

SAVE 40% Write for our complete list.

5 1/4 ' Specify soft, 10 or 16 sector Price/10 #744D 1 side/sgl/dbl dens ...... \$26.70 #745 #746 #747 2 sides/77 track . . . . . . . . . . . . . 45.50

Specify soft or 32 sector

#740 1 side/sgl dens.....27.30 

CHECKS — VISA — MC — C.O.D. (313) 777-7780 ADD \$2 SHIPPING

LYBEN COMPUTER SYSTEMS 27204 Harper Ave. St. Clair Shores, MI 48081

UNIFORTH

Check with us before you order

FORTH from any other dis-tributor. UNIFORTH is avail-

able for most Z-80, 8086/8088,

LSI/PDP-11, 68000 or 16032

computers, either stand-alone or as a task under an operating

system. UNIFORTH adheres to

the FORTH-79 standard, and

includes a video editor, floating

point routines, and an assembler.

We offer a solid, professional

system with extensive documen-

option packages. (basic) to \$300

Authorized Distributor Information Processing Products



Circle 236 on Inquiry card.

# LOOK TO THE FUTURE..

The only EPROM programmer you need!

- IEEE-696 (S-100) EPROM programmer for single supply (+5V) EPROMS.
  Programs current 1K through 16K (byte) EPROMs plus future 32K EPROMS.
- 32K EPROMS.

  EPROM can be verified through a port or located in memory space for verification and use.

  Personality Modules adapt board to different EPROM types:

  Personality Modules adapt board to different EPROM types:

  PM-1 2508, 2758 PM-3 2732, 2732 PM-6 68764 2516, 2716 PM-4 2564 PM-7 2528 PM-2 2532 PM-5 2764 PM-8 27128 Single zero-insertion-pressure socket accommodates both 24-pin and 28-pin EPROM packages.

  On-board DC-to-DC converter with adjustable regulator for pro-
- gramming voltage. Double-sided PC board with solder masks, silkscreen and
- pould-slade on coal with soluble masks, sukscient and gold-plated contact fingers. 8080/280 control software includes commands for program-ming, verification, disk I/O and editing. Comprehensive user's manual contains source listing of con-trol software.

# MicroDynamics

\$269.95 (assembled & tested)

Corporation (901)-755-0619

Price includes EPROM-32, documentation and two Personality Modules (specify). Additional Modules—\$7.95. Control so fiwer on 8 inch single density CP/M—compatible diskette—\$9.95.

MasterCard & Visa

TN residents add 6% sales tax

# PC/FORTH

graphics extensions, and target compiler available at additional cost.

Specify PC-DOS or CP/M-86®. One disk drive and 48 kbytes RAM required. Software supplied on 514 inch single sided soft sectored double

# Laboratory Microsystems

(213) 306-7412

Complete FORTH program development systems for the IBM® Personal Computer. Packages include interpreter/compiler with virtual memory management, line editor, custom screen editor, assembler, decompiler, utilities, file and record access modules, and many demonstration programs. 150 page user manual. . . . . \$100.00

Software floating point, Intel 8087 support, color

density diskettes.

# 4147 Beethoven Street Los Angeles, CA 90066

IBM is a registered trademark of International Business Machines Corp. CP/M is a registered trademark of Digital Research, Inc.

Circle 227 on inquiry card.

# Requires 8" floppies.

tation and

Prices: \$60 (multi-user).

> **Unified Software Systems** P.O. Box 2644 New Carrollton, Md 20784 (301) 552-1295

# DECADES OF SERVICE

# **Washington Computer Services**

97 Spring Street

New York, New York 10012

TO ORDER: CALL OUR TOLL-FREE NUMBER: (800)221-5416 In N.Y. State and for technical information: (212) 226-2121

HOURS: 9 AM-5:30 PM (EST) Monday-Friday

CUSTOM COMPUTER ROOM WIRING SINCE 1960

TELEX: 12-5606

CABLE: WASHCOMP NYK

WASHINGTON ))

#### **FULLY CONFIGURED BUSINESS SYSTEMS**

The following are some examples of the fully assembled and tested business and scientific computer systems which we offer:

The Premier Multi-User Computer System 8000 SX, multi-user, multi-processor, turbo DOS INTERNATIONAL CPM 2.2. FULL 2 YEAR WARRANTY!

50001S, S-100 desk top mainframe On-Site Service Contracts Available

MORROW DESIGNS MICHOOECISION

from below \$1200 8088/8055—Runs both 8 & 16 bit software. Green or high res.

color. CP/M, MS-DOS APC-8086, 16 bit, 128K, 8" DRIVES, 1024 ×1024 Color Graphic, 32 bit F.P. Proc., MS DOS, CP/M 86

# PC-8800 Personal Computer

The Professional's Work Station NEC on N.Y.S. Contract #P-07220

68000 16 bit multi-user, S-100. UNIX V. 7

**\$CALL** 

FOR

CONFIGURATION

**SEATTLE**COMPUTER

8086 16 bit, 128K RAM, S-100. Syst. #2

\$3499



California Computer Systems

Onter Systems

8 & 16 BIT BOARDS

**ALTOS** 

& SYSTEMS

SCION MicroAngelo Hi Res Graphics Systems

Similar savings on SSM, Delta, Dynabyte, Televideo, Digiac, Adds, Dec.

DATA GEN., ATARI, TECMAR AND MANY OTHERS

### PRINTERS

Teletype 40. 300 LPM-typerwriter quality, RS-232 from Only interface. This quality printer is available in many \$3200 configurations including forms access, quietized case, etc.

from \$995 Teletype 43 MANNESMANN TALLY ANADEX DIABLO **CENTRONICS NEC AMERICA EPSON** 

QUME C. ITOH **FACIT** DATA PRODUCTS SMITH CORONA OKIDATA

DIGITAL EQUIP. CORP. **TELETYPE** OLIVETTI

**TEXAS INSTRUMENTS** INTERGRAL DATA SYS. **QANTEX** 

Where Do You Turn To Solve Your Computer Puzzle?



an affiliate of

# TURN TO US!

We'll show you the easiest way to put the pieces together.

Matched, Compatible, Proven-Use Someone Else's Engineering to Supplement Yours.

# SOFTWARE

Over 2000 business, scientific, professional applications & educational packages are available. Call with your requirements for our advice or a quotation.

# 8" DISK DRIVE SALE

8" SHUGART SA801R \$385 8" SHUGART SA 851R \$540 2 for \$1025 **QUME DATATRACK 8 or MITSUBISHI** 2 for \$1050 \$550 Enclosure, power supply for 2 8" drives A & T \$350 MORROW DISCUS 2D + CP/M® MICROSOFT BASIC, CONT. \$950 **\$CALL** 

# **HARD DISK SPECIALS**

Corvus



TERMINALS

**TELETYPE TELEVIDEO** LEAR SIEGLER **ADDS** ANN ARBOR VISUAL

**PMMI MODEM** 

IBM 1301 DIGITAL EQUIP. CORP.

**HAZELTINE** 

AMPEX Dialogue 81™ Interactive Terminal



 Full cursor control Full editing keys

 Full visual attributes 2 pages (4 page

optional) Printer port

·Black & White, Green, or Amber screen

BACK TO SCHOOL SPECIAL! ZENITH ZT-1

> **Built-in Auto Dial Modem Terminal** DEC VT-52 Compatible; 96 ASCII + 33 graphics cursor

control keys. Editing functions. Many other functions.

\$359

PLEASE! Do not confuse us with mail order dealers. We are a full service distributor serving the data processing & installation needs of business & industry from micros to mainframes. System houses, Educational institutions & governmental agencies given special consideration. Leasing available.

N. Y. State agencies, municipalities, and schools — call us for information on our O.G.S. term contracts on hardware & software.

# DEALER and INTERNATIONAL INQUIRIES WELCOME

For fast delivery, send certified check, money order or call to arrange direct bank wire transfer. Personal or company checks require two to three weeks to clear. Prices subject to change without notice: call for latest prices. Prices include 3% cash discount. N.Y. residents add sales tax. Qantex is a trademark of North Atlantic Industries, Inc. CP/M® is a trademark of Digital Research. All sales subject to our standard sale conditions (available on request). Call for shipping charges. Above prices do not include customization or installation.

Circle 433 on inquiry card.



Circle 437 on inquiry card.

# TAXMAN-83

An Interactive TAX MANagement Program for VisiCalc™& Super Calc™ Users

TAXMAN-83 provides you with the capability to easily calculate your 1982 taxes by using the already proven VisiCalc \*\* and SuperCalc \*\* electronic

TAXMAN-83 prepares and prints 1982 individual income tax returns. TAXMAN-83 considers all tax alternatives, computes the lowest tax possible, tests reasonableness and tells you which forms are necessary for filing. TAXMAN-83 includes the following forms/schedules: Federal 1040; Schedules A, B, C, D, E, F, G, R, RP, SE, ES, U, W; Forms 1116, 2106. 2119, 2210, 2440, 2441, 3468, 3903. 4136, 4137, 4255, 4562, 4563, 4625. 4684, 4797, 4798, 4635, 4952, 4970, 4972, 5329, 5544, 5695, 5884, 6249, 6251, 6252, 6478, 6765, 6781; Tax schedules X, YS, YJ, Z; Tax tables; Sales tax tables for all states.

TAXMAN-83 is now available for most microcomputers utilizing VisiCalc<sup>TM</sup> or SuperCalc



PRICED AT ONLY \$95.00 1-205-533-7590



ATSUKO COMPUTING INTERNATIONAL 303 Williams Avenue, Huntsville, AL 35801

Direct orders please add \$4.00 for shipping/handling and sales tax where applicable VisiCatc is a trademark of VisiCorp. SuperCatc is a trademark of SORCIM Corporati

Circle 39 on Inquiry card.

# The ACCOUNTER

Apple II, 48K, One Disk Drive Double Entry, Menu-Driven GENERAL LEDGER

- Cash Journal · Check Record
- Payables Receivables
- Payroll
  - ► Flexible, simple to apply
  - ► Sort, test, view, audit
  - ► Current financial statement
  - ► User-error recovery
  - ► Formatted printout
  - ► 60-page manual
  - ► Many more features
  - GREAT FOR NON-ACCOUNTANTS

Limited-time special \$89.00 Add \$5.79 tax in California Money-back guarantee



# Improve the EPSON?

Sure, with

Auto On-Line

Forget to turn the EPSON back online? Auto On-Line remembers.

Does the remote printer hand up because people leave it off-line? If someone leaves it off-line for more than 20 seconds, Auto On-Line turns it back on-line automatically. No more hang-ups.

Assembled, tested and ready to plug in to any MX80 series

check or money-order \$19.95 Send (Postage and Handling INCLUDED, Conn. res. add 7 1/2% tax.) Dealer inquiries welcome.

KRER Associates

6 Waterbury Rd, North Haven,CT 06473

Circle 224 on inquiry card.

# NEW PRODUCT!



# CP/M Z80-A SINGLE BOARD COMPUTER

• On board video • Wide line and thin line graphics • 128K of RAM • Sasi interface • Floppy disk controller for up to four 5-1/4 and four 8 inch drives, single/double density simultaneously • 4 serial ports • Full Centronics printer port • Expansion bus • Extended track buffer • 16K printer buffer DMA • Compact size (8-1/4 x 12-1/4)

\$600.00 on orders placed and paid for prior to March 1, 1983 FOB Los Angeles, CA \$7.00 shipping

INSIGHT ENTERPRISES, CORPORATION

73 N Western Ave Suite 12 os Angeles, CA 90004 (213) 461-3262 FEE

Dealer, OEM, International Inquiries Welcome

Circle 208 on inquiry card.

# Y.E.S., We have the best...

# prices available on I.C.'s.

| 2114           | 200ns | 1.50  |
|----------------|-------|-------|
| 4116           | 150ns | 1.35  |
| 4164 Pla.      | 200ns | 5.50  |
| 4164 Cer.      | 200ns | 5.70  |
| 4164 Cer.      | 150ns | 6.00  |
| 6116P-3        | 150ns | 4.75  |
| 6116LP-3       | 150ns | 5.70  |
| 58725 NMOS     | 200ns | 4.50  |
| 2716           | 450ns | 3.40  |
| 2732           | 450ns | 4.00  |
| 2764           | 250ns | 9.95  |
| 2532           | 450ns | 4.90  |
| Z80A CPU,CTC,F | OIO   | 3.35  |
| Z80A SIO       |       | 12.00 |
| 8255A-5        |       | 3.00  |
| D8080A 2MHZ    |       | 3.90  |
| Z80B CPU       |       | 10.00 |
|                |       |       |

\*C.O.D., Master Charge and Visa accepted. \*Ask for OEM quantity prices.

## Yang Electronic Systems, Inc.

307 Compton Ave., Laurel, MD 20707

(301)776-0076

# SAVE \$\$\$

IBM™-PC USERS

Buy RAM Card/Serial Port direct from the manufacturer

**COMPARE OUR PRICES** RAM Card 64K populated, expandable to 512K ...... \$239 RAM Card 128K populated, expandable to 512K ...... \$319 RAM Card 256K populated, expandable to 512K ...... \$479 RAM Card 512K populated, expandable to 512K ...... \$799 

# LOOK AT THESE FEATURES!

- Multilaver Board for Low Noise
- Socketed for Easy Upgrade to 512K memory.
- One Year Warranty
- Parity Generate/Check Error Detecting Capability
- Fully compatible with IBM-PC Soltware & Hardware Specs
- Easy to Follow Instructions Included
- Serial Port may be Configured as COM1 or COM2
- Address Flexibility Each 64K Block is Address Selectable for any Base Address.

Dealers inquiries welcome • Add \$5 for Shipping • California Resident, Add 6% Sales Tax.
Call or Send Check/Money Order to:

#### MK Research

14682 Orange Acres • Irvine, California 92714 Telephone: (714)559-1598

Circle 284 on inquiry card.

# PRINTER CABLES **ALSO CRT & MODEM CABLES**

CUSTOM MFG. TO YOUR **SPECIFICATIONS** SEND FOR

FREE CATALOG

SEND A SAMPLE

- -IT WILL BE RETURNED WITH QUOTATION
- -SPECIFY QUANTITIES TO BE QUOTED

SECTOR SYSTEMS CO. **PO BOX 751** MARBLEHEAD, MA 01945

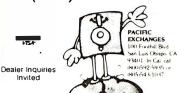
Circle 380 on Inquiry card.

# Scotch Diskettes

Rely on Scotch® diskettes to keep your valuable data safe. Dependable Scotch diskettes are tested and guaranteed error-free. The low abrasivity saves your read/write heads. They're compatible with most diskette drives.

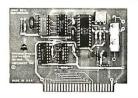


(800)235-4137



Circle 318 on inquiry card.

# SPEECH SYNTHESIZERS



JBEs Speech Synthesizers use the Votrax SC-01 Phoneme Synthesizer chip. The SC-01 phonetically synthesizes continuous speech of unlimited vocabulary. The SC-01 contains 64 different phonemes and 4 levels of inflection accessed by an 8 bit code. It requires 10 Bytes per second for continuous speech. Both boards have an audio amp for direct connection to an 8 ohm speaker.

Documentation includes basic user programs, a phoneme chart and listing of coded words to help you get started Documentation for the Apple II® Speech Synthesizer includes a disk with text to speech program.

| 81-088 Apple II Speech        | A        |
|-------------------------------|----------|
| Synthesizer                   | \$129.95 |
| 81-120 Parallel Input Speech  | 100      |
| Synthesizer                   | \$149.95 |
| Prices include the SC-01 Chin | # TO 100 |

SC-01 sold separately for

# A-D & D-A CONVERTER



JBF A-D & D-A Converter can be used with any system having parallel ports • Interfaces with JBE Parallel I/O Card • D-AConversiontime — 5μs • A-D conversion time — 20μs • Uses JBE 5V power supply . Parallel inputs & outputs include 8 data bits, strobe lines & latches • Analog inputs & outputs are medium impedance 0 to 5 volt range.

79-287 Bare Board ASSM \$79.95 \$39.95

\$ 39 95

# SOLID STATE SWITCH



your printer, lights, stereo & any 120VAC appliances up to 720 watts (6 amps at 120VAC). Input 3 to 15VDC • 2-14MA TTL compatible • Isolation -1500V • Non zero crossing • Comes in 1 or 4 channel version

#### 6502 MICROCOMPUTER

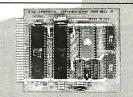


6502 MPU, 6522 VIA, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 400 Ma. Two independent 8 bit 1/O ports with handshake lines. RC controlled 1 MHz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

# **Z-80 MICROCOMPUTER**

Assm. \$110.95



Z-80 MPU, Z-80 PIO, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 300 Ma. Two Independent 8 bit I/O ports with handshake lines. RC controlled 2MHz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

CRT CONTROLLER

This intelligent CRT Controller uses an

8085A CPU and an 8275 Integrated CRT

Controller. It features:

Upper & lower case

Two 2716's (controller & char.

generator) Serial interface RS232 & TTL

1200, 2400, 4800 and 9600

Keyboard scanning system

· Unencoded keyboard required

Uses +5V & ± 12V Power Supplies
Does not have graphic capabilities.

Documentation includes program

listing and composite video circuit.

BareBoard only (with doc)

2716Char.Gen.A7

2716 Program A12

2716ASCILA12

11.34 MHzXTAL

• Baud rates of 110, 150, 300, 600

 25 lines (80 char./line) • 5x7 dot matrix

80-280

Assm. \$129.95

#### MINI VIDEO 40 X 24



This board can be used to add a video display to your AIM or other computer. It can also, with the addition of a parallel keyboard, 5V power supply and video monitor, be used as a home computer. It will run Tom Pittman's Tiny Basic. The 2716 character gen. will produce 256 8x8 characters, ASCII upper and lower case and graphic characters. The 44 pin expansion connector can be used to add up to 6K of memory or extra I/O ports. Power requirements: 5 volts 600 MA 3 watts

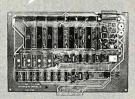
Documentation includes schematic, parts list, connector pin outs, and source listing for video display and Monitor. Control character response:

- H back space
- up one line
- line feed
- clear screen and home
- carriage return
- forward space non destructive

The curser is flashing underline type.

82-140A assm. W/O EPROMS \$149.95 CharacterGen A7 \$ 19.95 Tiny Basic + Monitor \$39.95 GPIO Parallel Input \$ 19.95 Bare Board with doc. \$ 79.95

# JBE I MICROCOMPUTER



JBE's 7.75 x 11.75 6502 base Microcomputer has the capacity for 16K of EPROM, 4K of RAM, 8 Parallel Ports and 1 Serial Port. Monitor and Tiny Basic are also available.

Both versions include sockets for 2716s or 2532s, 8 16 pin sockets for I/O interfacing and a DB25 connector for

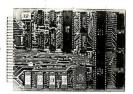
All address and data lines are brought off the board to the 50 pin edge connector. (Similar to the Apple II bus.)

This board also features power on reset and cassette interface.

81-030C Fully Populated 81-030M Partially \$399.95 Populated \$299.95 2716 FPROM \$ 19.95 (with Tiny Basic)

#### 81-260

"SLIM"



Single board large scale integration Microcomputer. This 4.5 x 6.5 board uses the 6502 Microcomputer, two 6522 VIA's four 2114 RAM's, 2516, 2716 or 2532 EPROM. The fully buffered 22/44 pin bus is similar to the KIM®, SYM®, and AIM® expansion connector. The four 8 bit I/O ports connect through 16 pin dip sockets. This board was designed for control and is ideal for Personal and OEM use.

- 6502 MPU
- Two 6522 VIA's
- Four 2114 RAM's (2K bytes) • One EPROM 2516 or 2532
- Crystal clock 1 MHz
   Requires 5V 1AMP power
- 4.5 x 6.5 card
- Power on reset
- Fully buffered-expandable
- Solder mask-both sides

Use your Apple II Computer, JBE 6522 Parallel Interface card and EPROM Programmer as a development system for

81-260A

Assm. \$199.95

# PHERIPHERALS FOR SLIM



RAM EPROM Memory (32K) 81-330A Assm. W/O Memory

81-330B Bare Board

\$49.95

6 Slot Mother Board 81-320A Assembled 81-320B Bare Board

\$99.95 \$49.95

\$99.95

24 Hour Real Time Clock 81-350A Assembled 81-350B Bare Board

\$149.95 \$ 49.95

Analog I/O Interface 81-036A Assembled 81-036B Bare Board

\$199.95 \$ 49.95

12 Port Parallel I/O (6-6522'S) 82-036A Assembled 82-036B Bare Board

\$169.96 \$ 49.95

Tiny Basic + Monitor EPROM

\$39.95



# JOHN BELL ENGINEERING, INC.

ADD SALES TAX IN CALIFORNIA • ADD 5% SHIPPING & HANDLING 3% FOR ORDERS OVER \$100 SEND \$1.00 FOR CATALOG

(415) 592-8411 WILL CALL HOURS: 9am - 4pm

ALL PRODUCTS ARE AVAILABLE FROM JOHN BELL ENGINEERING, INC. • 1014 CENTER ST., SAN CARLOS, CA 94070

\$39.95

\$19.95

\$19.95

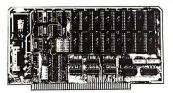
\$19.95

\$5.00

10% OUTSIDE U.S.A. ADD \$1.50 FOR C.O.D



**BATTERY BACKUP 32K** CMOS RAM/EPROM S-100 MEMORY BOARD 8 or 16 BIT DATA PATH \$199 KIT, \$279 A&T



- phantom option IEEE 696 (S-100) compatible
- extended addressing switch selectable bank select EPROM can be mixed with RAM

Yang Electronic Systems, Inc.

307 Compton Avenue, Laurel, MD 20707

(301) 776 -0076

Circle 462 on inquiry card.

# THE BURNER I/O

Has a complete EPROM programmer, two serial ports, one parallel I/O port with handshaking and memory

Programmer features: Programs 2704, 2708, 2508, 2758, 2716, 2516, TMS2716, 2732, 2732A, 2764 • CP/M compatible software supplied in EPROM that can be easily written on a diskette. EPROM selection is done with software. Does not use programming modules • Programmer is totally I/O mapped • Programming color in the programming and the programming solve is received in fecultary. socket is zero insertion force type • Programming voltages generated on board.

I/O Features: • 2 fully independent RS-232 serial ports • Baud rate Generators are independently programmablefrom50to 19200baud • Independentle bit output, input and status flags • 4 direct sense lines.

Memory management features: • Controls address lines A16-A23 • Is disabled with standard ADSB\* signal.

Options: • Complete board with programmer, I/O and memory management, \$354.95 • Programmer only, \$219.95 • I/O only, (25 · P) \$219.95 • Prog. and I/O, \$329.95 • Memory management only \$109.95.

Memory management may be added to programmer or I/O for \$25.00. All combinations are assembled and tested, Delivery Stock Shipping: UPS surface \$3.00,

# EXTENDED PROCESSING

3861 Woodcreek Lane San Jose, Ca. 95117 (408) 249-8248

Circle 268 on inquiry card.



#### RS232C Computer compatible Paper Tape Transmitter/Model 612

Stops and starts on character at all speeds, uses manual control or X-on, X-off 90-260 volt, 50-60 Hz power. 50-9600 baud, up to 150 char/sec synchronous or asynchronous: gated internal or external clock, RS 232C, current loop or parallel output, reads 5-8 level tape, 7-11 frames per character, even or odd parity. Desk top or rack mount.

Addmaster Corporation, 415 Junipero Serra Drive, San Gabriel, CA 91776, (213) 285-1121, Telex 674770 Addmaster SGAB

# NEW FOR APPLE II ®

# LOW-COST PRECISION A/D CONVERTER

- \* IDEAL FOR MONITORING AND CONTROL
- \* RESOLUTION TO ONE MILLIVOLT
- RANGE OF ± 4.864 VOLTS
- \* MAXIMUM CONVERSION TIME 200MS
- \* 4 DIFFERENTIAL ANALOG INPUTS
- \* 4 OPTICALLY ISOLATED DIGITAL CONTROL OUTPUTS
- **EXPANDABLE TO 64 CHANNELS**
- \* LOW POWER CONSUMPTION
- CUSTOM SENSORS AND SYSTEMS AVAILABLE

\$250 WITH FULL YEAR WARRANTY

# LAWSON LABS, INC.

5700 RAIBE ROAD COLUMBIA FALLS, MONTANA 59912

406-387-5355

Circle 228 on inquiry card.



2764...

\$480 80C85.....\$17<sup>20</sup>

MOS 8085 CPU, with info

Send for catalog. Quantity prices available. Colorado residents add tax. Add \$1 shipping per order. Credit card OK.

# Colorado Chios P. O. Box 111, Frisco, CO 80443

Circle 471 on inquiry card,

\$645 excluding shipping

- Portable Olivetti Typewriter
- Daisy Wheel Printer
- ·Based on the Praxis 30
- · Centronics Compatible Printer OLIVETTI APPROVED
- Already own a Praxis? Easy to install interface available

TO ORDER - See your local dealer or send check or money order to:

# **ARK Microsystems**

925 Greenwood St. Ann Arbor, MI 48104 (313) 769-7253



Call Toll-Free

1-800-328-DISC for prices and information. Dealer inquiries invited. C.O.D. and charge cards accepted.

All orders shipped from stock, within 24 hours. Call toll FREE



#### North Hills Corporation

3564 Rolling View Dr. White Bear Lake, MN 55110 1-800-328-DISC

MN Call Collect 1-612-770-0485

Circle 303 on inquiry card.

# RIBBON CARTRIDGES \$ 4.75 ea.

MX 70-80 **MX 100** 

10.75 ea.

Please add \$.75 ea. handling/shipping.

# LARFI.

\$12.00/5000

STOCK #10350-1-15/16"x 31/2" x 1 wide. White—pressure sensitive—pin feed— 4¼" carrier, packed 5000 per box. Add \$2.50 per box handling/shipping

TERMS: Visa & M.C. (add 4%), check or money order. C.O.D.'s. add \$2.00, min. order \$12.00. CA residents add 6% Sales Tax.

 $S_{}^{\epsilon}$  Computer supply co.

25422 TRABUCORD. SUITE #200 EL TORO, CA. 92630 · (714) 768-0370

Circle 373 on inquiry card.

# Printed Circuit A/B Switch



- Ideal for switching RS-232 devices
- High Quality Printed Circuit Board
- 3 25 pin D-subminiature Connectors · 20 circuits switched

Device A--Common

Kit & Assembly Drawing ...... \$34.95 ppd. Assembled & Wave Soldered ..... \$39.95 ppd.

Visa/Master Charge (201) 227-8411

16-6 Passaic Avenue Fairfield, New Jersey 07006

Circle 7 on inquiry card.

Circle 31 on inquiry card.

Circle 331 on inquiry card.

Device B-

# Wabash diskettes as 1.39 each!

## Now...Get High Quality at a Low Price

Wabash means quality products that you can depend on. For over 16 years, Wabash has been making high quality computer products. Wabash diskettes are made to provide error-free performance on your computer system. Every Wabash diskette is individually tested and is 100% certified to insure premium performance.

# Why Wabash is Special

The quality of Wabash diskettes is stressed throughout the entire manufacturing process. After coating, all Wabash diskettes go through a unique burnishing process that gives each diskette a mirror-smooth appearance. Wabash then carefully applies a lubricant that is specially formulated to increase diskette life. This saves you money, since your discs may last longer. It also assists your disk drives in maintaining constant speed which can reduce read and write errors.

# Special Seal...Helps Prevent Contamination

Tokeepoutforeign particles, a unique heat seal bonds the jacket and liner together. A special thermal seal which avoids contamination from adhesives, is then used to fold and seal the jacket. This results in outstanding performance and true reliability. Wabash then packages each diskette, (except bulk pack) in a super strong and tear resistant Tyvek® evelope. The final Wabash product is then shrink-wrapped to insure cleanliness and reduce contamination during shipment.

## Each Diskette is 100% Critically Tested

Since each step in the Wabash diskette manufacturing process is subject to strict quality control procedures, you can be sure Wabash diskettes will perform for you. And every Wabash diskette meets the ultra-high standards of ANSI, ECMA, IBM and ISO in addition to the many critical quality control tests performed by Wabash. Wabash does all of this testing to provide you with consistently high quality diskettes. Reliability and data integrity – that's what Wabash quality is all about.

# Flexible Disc Quantity Discounts Available

Wabash diskettes are packed 10 discs to a carton and 10 cartons to a case. The economy bulk pack is packaged 100 discs to a case without envelopes or labels. Please order only in increments of 100 units for quantity 100 pricing. With the exception of bulk pack, we are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. Quantity discounts are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Wabash diskettes are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Wabash diskette compatibility hotline. Dial toll-free 800-323-9868 and ask for your compatibility representative. In Illinois or outside the United States dial 312-593-6363 between 9 AM to 4 PM Central Time.

| SAVE ON WABASH DISKETTES Product Description      | Part # | CE quant.<br>100 price<br>per disc (\$) |
|---------------------------------------------------|--------|-----------------------------------------|
| 8" SSSD IBM Compatible (128 B/S, 26 Sectors)      | F1,11  | 1.99                                    |
| 8" Same as above, but bulk pack w/o envelope      | F111B  | 1.79                                    |
| 8" SSSD Shugart Compatible, 32 Hard Sector        | F31A   | 1.99                                    |
| 8" SSDD IBM Compatible (128 B/S, 26 Sectors)      | F131   | 2.49                                    |
| 8" DSDD Soft Sector (Unformatted)                 | F14A   | 3.19                                    |
| 8" DSDD Soft Sector (256 B/S, 26 Sectors)         | F144   | 3.19                                    |
| 8" DSDD Soft Sector (512 B/S, 15 Sectors)         | F145   | 3.19                                    |
| 8" DSDD Soft Sector (1024 B/S, 8 Sectors)         | F147   | 3.19                                    |
| 51/4" SSSD Soft Sector w/Hub Ring                 | M11A   | 1.59                                    |
| 51/4" Same as above, but bulk pack w/o envelope   | M11AB  | 1.39                                    |
| 5¼" SSSD 10 Hard Sector w/Hub Ring '              | M41A   | 1.59                                    |
| 51/4" SSSD 16 Hard Sector w/Hub Ring              | M51A   | 1.59                                    |
| 51/4" SSDD Lanier No-problem compatible           | M51 F  | 2.99                                    |
| 574" SSDD Soft Sector w/Hub Ring                  | M13A   | 1.89                                    |
| 51/4" Same as above, but bulk pack w/o envelope   | M13AB  | 1.69                                    |
| 5¼" SSDD Soft Sector Flippy Disk (use both sides) | M18A   | 2.79                                    |
| 51/4" SSDD 10 Hard Sector w/Hub Ring              | M43A   | 1.89                                    |
| 5¼" SSDD 16 Hard Sector w/Hub Ring                | M53A   | 1.89                                    |
| 5¼" DSDD Soft Sector w/Hub Ring                   | M14A   | 2.79                                    |
| 5¼" DSDD 10 Hard Sector w/Hub Ring                | M44A   | 2.79                                    |
| 51/4" DSDD 16 Hard Sector w/Hub Ring              | M54A   | 2.79                                    |
| 51/4" SSQD Soft Sector w/Hub Ring (96 TPI)        | M15A   | 2.69                                    |
| 51/4" DSQD Soft Sector w/Hub Ring (96 TPI)        | M16A   | 3.79                                    |

$$\begin{split} & SSSD = Single \ Sided \ Single \ Density; \ SSDD = Single \ Sided \ Double \ Density; \ DSDD = Double \ Sided \ Double \ Density; \ SSQD = Single \ Sided \ Quad \ Density; \ DSQD = Double \ Sided \ Quad \ Density; \ TPl = Tracks \ per \ inch. \end{split}$$

#### **Buy with Confidence**

To get the fastest delivery from CE of your Wabash computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices. terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum prepaid order \$50.00. Minimum purchase order \$200.00. International orders are invited with a \$20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add \$8.00 per case or partial-case of 100 8-inch discs or \$6.00 per case or partial-case of 100 5¼-inch mini-discs for U.P.S. ground shipping and handling in the continental United States.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your Wabash diskettes from Communications Electronics today.

Copyright \*1982 Communications Electronics

Ad #110582









Order Toll-Free! 800-521-4414

In Michigan 313-994-4444

wabash error-free diskettes

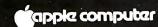


# **Computer Products Division**

854 Phoenix D Box 1002 Ann Arbor, Michigan 48106 U.S.A. Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

# RanaSystems

\$295. **Elite**One \$499. **Elite**Two \$649. **Elite**Three **Elite**Controller \$ 89.



HARDWARE/SOFTWARE

# GARDEN OF EDEN COMPUTERS

13147 Cedar Street Westminster, CA 92683

714-894-9528

24 Hours — 7 Days Ask for our newest Price List

VISA

Circle 180 on inquiry card.

# Relocatable Threaded Language

RTL is a new language which retains the speed and extensibility of Forth but adds many additional advantages as a result of its more structured dictionary. Names, code, and variables are all stored in separate areas for easy generation of headerless, romable code. All code is relocatable. RTL supports local variables, multitasking, redirected I/O, and even allows definitions to be changed retroactively. All source code is included. Versions are currently available or under development for 68000, 6809, 8080, 280, 8086, 8088, and 6502.

> RTL Programming Aids 10844 Deerwood SE Lowell, MI 49331 (616) 897-5672

Circle 371 on inquiry card.



INCLUDING MORROW TERMINAL. ELSE \$3545 \$3995 Call on all MORROW Product Decision 1, 14 Stot S-100, Z-90, 65K Static, 1 to User (Need more memory, Softwari 8 I/O for 6 users) Desk rop, with 3 Serial & IP. CP/M. Wordstar . Basis 80; Correct-It! . Loocale: . Bazic! . Pilot: : 8 Pearl Data Base Management System : CPC also includes: Payroll, GL. AR, AP, Fixed Assets, Raw & Finished Inventory, Mail List, Transcendental Pak, Loan Amortization, 6 Function Compound Interest, 400K of CP/M Utility Source Code, and StarTrek.

Shipment from factory with factory warranty, ofessional tutoring buddy system for beginners.

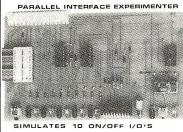
All CompuPro cost-plus 10% or less. Shipment from distributor's stock Call for our system prices.

Ashton-Tate Full line of dBase II. Financial Planning, Forecast ing. & related software. PRINTERS: OKI, Cltoh, NEC, Diablo, M/T. etc.

CALL US 9 AM to 10 PM COMPU

205 879-5976 P.O. Box 6114 • Birmingham, AL 35259-611 205 879-4735 Our bank is 1st National of Birmingham, (205)326-512

# MICRO PIE



CONNECTS TO TTI. CMOS AND CHIPS (8255-6522-6821)

SIMPLIFIES DEBUGGING FAST SETUP · · · COMPACT

TEKSYM CORPORATION

14504 COUNTY ROAD 15 MINNEAPOLIS, MN. 55441

Circle 406 on inquiry card.

BASF Diskettes at competitive price. Call TOLL FREE (800) 235-4137 for prices and information. Visa and Master Card accepted.



Circle 318 on inquiry card.

## **COMPACT 20K** SINGLE BOARD COMPUTER

µCortex™/20K has64I/O lines, 6502 CPU, 4K RAM, 16K EPROM, 4 Mhz crystal, power-on 555 start-up and reset, 4 NMIs, two 7805 regulators. Support boards and software packages available. Single unit price: 2K RAM: \$159.95; 4K RAM: \$169.95 (EPROMs not included).

Smaller µCortex\*\*/65 board with 1K RAM, 2 or 4K EPROM, 16 I/O lines, 555, crystal and NMI: \$79.95. Add \$3.75 for shipping/ handling. OEM discounts.

Cortex Research Corporation 1912 Raymond Dr., Northbrook, IL 60062 Phone: 312-480-1088

Circle 122 on inquiry card.

# CONTROL DATA DISKETTES

5 1/4" SPECIFY SOFT. 10 or 16 SECTORS PRICE/10 PRICE/50 PRICE/100 SSSD \$23.00 \$112.00 \$215.00 26.00 126.00 235.00 32.00 156.00 295.00 DSDD 8" SPECIFY SOFT or 32 SECTORS PRICE/10 PRICE/50 PRICE/100 SSSD \$25.00 S122.00 S223.00 SSDD \_\_\_\_\_ 30.00 145.00 263.00 165.00 303.00 DSDD CALL TOLL FREE - ORDERS ONLY 800-824-7888 ALL STATES EXCEPT CA 800-852-7777 FOR CA RESIDENTS

ASK FOR OPERATOR #906 CHECKS. M.O., VISA. M.C., - ADD \$2.00 SHIPPING CA RESIDENTS ADD 6% SALES TAX

Creativity Unlimited P.O. Box 3304, Saratoga, CA 95070-1304

Circle 125 on inquiry card.

# SUPER-FAST! **Z**80 DISASSEMBLER \$69.95

Uses Zilog Mnemonics, allows user defined labels, strings, and data spaces. Source or listing-type output with Xref to any device. Available for Z80 CP/M or TRS-80.

# SLR Systems

200 Homewood Drive Butler, PA 16001 (412) 282-0864

Add \$2.00 shipping. Specify format required. Check, money order, VISA, Master Card, C.O.D. PA residents add 6% sales tax. Dealer Inquiries Invited. "CP/M. TRS-80 TM of Digital Research. Tandy Corp.

Circle 383 on inquiry card.

# FREE! FREE! FREE! FREE! FREE



905 S. Vermont Ave. P.O. Box 20406 Los Angeles, Cal. 90006

Circle 14 on inquiry card.

# Why use other computer media when you could be using

# Scotch®

# high quality error free media?

Get Scotch Diskettes Directly From Communications Electronics There's a lot of valuable data stored on the diskettes in your computer or word processing system. In 1981, a diskette manufacturer calculated that the "true cost of a diskette" was \$186.50 after data loading. With inflation, the actual cost is well over \$200.00 today. That is why you don't want to use just any diskette, you want the high reliability and quality of Scotch diskettes. You can trust Scotch diskettes to deliver that accuracy because each diskette is tested before it leaves the factory and is certified error-free. That means fewer errors and less lost data. Flexible discs may look alike, but they don't all perform alike. Scotch diskettes can deliver all the performance you'll ever need. The low abrasivity of Scotch diskettes, 32% below industry average, saves wear and tear on your read/write heads, which means fewer service calls due to head problems. Longer and more reliable service is yours when you buy Scotch diskettes since they far exceed the industry standard durability tests. Finally, your Scotch diskettes are packaged in units of 10, complete with color-coded labels (except bulk product) to make your filing easier.

### Flexible Disc Quantity Discounts Available

Scotch diskettes are packed 10 discs to a carton and five cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. Quantity discounts are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Scotch diskettes are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the 3M/Scotch flexible disc compatibility hotline. Dial tollfree 800-328-1300 and ask for the Data Recording Products Division. In Minnesota or outside the United States dial 612-736-9625 between 9 AM to 4 PM Central Time.

| SAVE ON SCOTCH FLEXIBLE DISCS Product Description | Part #     | CE quant.<br>100 price<br>per disc (\$) |
|---------------------------------------------------|------------|-----------------------------------------|
| 8" SSSD IBM Compatible (128 B/S, 26 Sectors)      | 740-0      | 2.19                                    |
| 8" Same as above, but bulk pack w/o envelope      | 740-0B     | 1.99                                    |
| 8" SSSD Shugart Compatible, 32 Hard Sector        | 740-32     | 2.19                                    |
| 8" SSSD CPT 8000 Compatible, Soft Sector          | 740-0-8000 | 2.89                                    |
| 8" SSDD IBM Compatible (128 B/S, 26 Sectors)      | 741-0      | 2.89                                    |
| 8" DSDD Soft Sector (Unformatted)                 | 743-0      | 3.49                                    |
| 8" DSDD Soft Sector (256 B/S, 26 Sectors)         | 743-0/256  | 3.49                                    |
| 8" DSDD Soft Sector (512 B/S, 15 Sectors)         | 743-0/512  | 3.49                                    |
| 8" DSDD Soft Sector (1024 B/S, 8 Sectors)         | 743-0/1024 | 3.49                                    |
| 5¼" SSDD Soft Sector w/Hub Ring                   | 744D-0RH   | 2.34                                    |
| 54" Same as above, but bulk pack w/o envelope     | 744 D-0RHB | 2.14                                    |
| 51/4" SSDD 10 Hard Sector w/Hub Ring              | 744D-10RH  | 2.34                                    |
| 5¼" SSDD 16 Hard Sector w/Hub Ring                | 744D-16RH  | 2.34                                    |
| 5¼" DSDD Soft Sector w/Hub Ring                   | 745-0RH    | 3.09                                    |
| 5¼" DSDD 10 Hard Sector w/Hub Ring                | 745-10RH   | 3.09                                    |
| 5¼" DSDD 16 Hard Sector w/Hub Ring                | 745-16RH   | 3.09                                    |
| 5¼" SSQD Soft Sector w/Hub Ring (96 TPI)          | 746-0RH    | 2.99                                    |
| 574" DSQD Soft Sector w/Hub Ring (96 TPI)         | 747-0RH    | 3.99                                    |

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.

## Circle 81 on Inquiry card.

#### Save on Scotch Static Control Floor Mats

Scotch Velostat Electrically Conductive Floor Mats, drain static charge before it can cause serious problems with computer or word processing equipment. Order number 1853 is a black4' x5' size mat with lip. Cost is \$170.00 each. Order number 9453 is the same mat, but the color is earthtone brown, which is designed to blend with any office decor. Cost on the 9453 mat is \$259.00 each. All Velostat mats come complete with 15 feet of ground cord. All mats are shipped freight collect.

## Save on Scotch Data Cartridges

Scotch Data Cartridges are available from CE in three different configurations. The DC100A data cartridge is a small version of the DC300A data cartridge. The DC100A contains 140 feet of 0.150" tape in a package measuring 2.4 x 3.2 x 0.5 inches. Cost is \$14.00 each. The DC300A is a pre-loaded tape cartridge containing 300 feet of one mil thick by ¼" computer tape. The DC300A costs \$18.00 each. The DC300XL is an extra length data cartridge with 450 feet of tape. It is the same size and interchangeable with the DC300A. The DC300XL provides a total storage capacity of 34.5 million bits at 1600 BPI. The cost of the DC300XL is \$22.00 each.

# Scotch Head Cleaning Diskettes – Helps Cut Downtime When the read/write heads on information processing machines

When the read/write heads on information processing machines are dirty, that can cause you a lot of grief. Now...with Scotch brand head cleaning diskettes, you can clean the read/write heads on the diskette drives yourself in just 30 seconds and as often as they need it. Simply apply the cleaning solution to the special white cleaning fabric. Insert the cleaning diskette into the drive and access the heads for 30 seconds. That's all there is to it. Regular use of the head cleaning diskettes can save you much of the grief caused by dirty heads. We recommend you use them once a week, or more often if your system gets heavy use. Each kit contains two head cleaning diskettes, and enough solution for 30 cleanings. Order # 5-CLE is for 5\%" drives and order # 8-CLE is for 8" drives. Only \$25.00 each plus \$3.00 shipping per kit.

#### **Buy with Confidence**

To get the fastest delivery from CE of your Scotch computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum prepaid order \$50.00. Minimum purchase order \$200.00. International orders are invited with a \$20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add \$8.00 per 100 diskettes and/or any fraction of 100 8-inch diskettes, or \$6.00 per 100 diskettes and/or any fraction of 100 5%-inch mini-discs. For cleaning kits, add \$3.00 per kit. For tape data cartridges, add \$1.00 per cartridge, for U.P.S. ground shipping and handling in the continental United States.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your Scotch computer products from Communications Electronics today.

Copyright \$1982 Communications Electronics™











# Order Toll-Free! (800) 521-4414

In Michigan (313) 994-4444





# **Computer Products Division**

854 Phoenix D Box 1002 Ann Arbor, Michigan 48106 U.S.A. Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

# DATA COMMUNICATIONS SPECIALISTS FOR

# **IBM PC & SEATTLE COMPUTERS**

Teleprocessing software available for above computers to time-sharing host or between two users (send binary files, also). Version 2 software, \$60; Version 3, IBM PC \$95, SEATTLE \$160. Write for details or \$3.00 for manuals.

# SEATTLE 8086 GAZELLE

Computer system.
SPECIAL PRICE for SEATTLE SYSTEM Gestop) +4-port serial board + cables + choice of Microsoft BASIC. Pascal, FORTRAN, or COBOL.

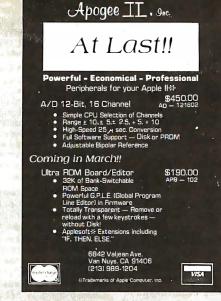
Write for literature and prices on above

systems, or call for quote.

CSCS COMPUTER & STATISTICAL CONSULTING SERVICES

P.O. Box 5351 Terre Haute. IN 47805 (812) 466-4111

Circle 129 on Inquiry card.



Circle 24 on Inquiry card.

# Valuable FORTRAN Enhancements with STRPAK™

STRPAK is a collection of 135 subroutines and functions specifically designed to enhance FORTRAN-80

- · String processing routines.
- Character processing routines.
- Directional character and number I/O.
- . CP/M system calls and file controls.

STRPAK source code (in RATFOR and MACRO-80): . . \$225.

RATFOR preprocessor for FORTRAN-80: . . . . . . . . . . . . . . . \$ 55.



Computer Company DIVISION OF Sea Data Corporation

One Bridge Street, Newton, MA 02158 TEL. (617) 244-8190 TLX: 951107

Circle 59 on Inquiry card.

# **VOICE SYNTHESIZER VOCABULARY DEVELOPMENT SYSTEM**

CREATE YOUR OWN CUSTOM VOCABULARIES For TI 5220 or GI SP-250 Speech Synthesizers Using Your S-100 or INTELLEC™ Micro

INCLUDES HARDWARE AND SOFTWARE FOR: DMA Voice Digitizing and Playback (8 bit mu-law codec) • Parameter Extraction and Coding • Screen Oriented Parameter Editor . Voice Synthesis

MODEL VPP-696 for S-100 (IEEE-696 Compatible) - CP/M80 MODEL VPP-796 for INTELLEC\* MDS - ISIS II



\$3900

(Includes Hardware and Software)

adisa disa corporation P.O. Box 1364 Palo Alto, CA 94301 (415) 326-7303

Circle 8 on Inquiry card.

#### VIC-H8-CRT

VIC 20 or 64 Bus Extender Board \$44\* 5 slots-3 installed, gold plated contacts VIC 20 24K Memory Expansion Board

24Kb, static 200 nano sec RAM, buffered, low power, LED power indicator, gold plated board contacts, socket for EPROM (2716 type)

VIC 20 24K Memory Expansion Board

with EPROM

Same as above, 40 character screen with

EPROM (2716 type)
CRT Electronics with keyboard For Ball Brothers or Zenith type CRT's, reverse video, blinking, underlining, 11 baud rates, upper/lower case, 80 x 24

character screen, clear end of line, clear end of page, clear screen H8 16K Memory Expansion Board\$229\* 16K static RAM RS232 serial, 8 line paral-

lel with line drivers
plus shipping and handling Washington Residents add sales tax.

**BAZ ELECTRONICS** P.O. Box 4895, Federal Way, WA 98003 (206) 874-3029

VISA



# Electronic Circuit Analysis

- DC and AC analysis Very fast, machine language
- Infinite circuits on multiple passes
- Worst case, sensitivity analysis
- Dynamic modification
- 64 Nodes, 127 branches
- Compare circuits
- Log or linear sweep
- Full file handling
- Frequency response, magnitude and phase Complete manual with examples
- TRS-80 (TRSDOS) \$90.00
- CP/M \$150.00

Tatum Labs P.O. Box 722 Hawleyville, CT 06440 (203) 426-2184

Can Something Really Transfer So Much Information So Well For So Little?

# The FORTEX XCopy Really Can!

Great for Winchester backups • Knows when the floppy is full and can break the file . "Submit" feature automatically copies preselected files • Runs on CP/M, MP/M & MSDOS

Best of all, it costs only \$99!



SYSTEMS CORPORATION

Call Collect: 516-549-4713 1935 New York Ave. Huntington Sta.,

N.Y. 11746

Circle 175 on Inquiry card.

Alphabetical LIST and database program. Designed for variable length fields and flexibility. Enter 50 records without a disk wait. Send selected records to screen, printer or disk file. Sort or re-sort records by ANY field.

Introducing ALISTA an advanced version of ALIST with added arithmetic capabilities.

Simplified Users Guides (ALIST or ALISTA MAIL/PHONE LIST REFERENCE/CITATION FILE CARDS Users guides for ALISTA ONLY. CHECKBOOK/BUDGET HOME INVENTORY

(Included) 10.00

(included)

10.00

Requires 48K CP/M. Available for the Osborne 1, 8" SSSD CP/M, SuperBrain, Advantage... call for other disk formats.

ALIST (Alphabetical LIST program)
ALISTA (Added features)

150.00 175.00

HONOR SYSTEM SOFTWARE 2562 E. Glade Mesa, AZ 85204 (602) 892-2434

Circle 198 on Inquiry card.

WILL BEAT ANY COMPETITOR'S PRICE PROVIDED IT IS NOT BELOW MY COST. TRY TO BEAT THESE IC PRICES:

| D        | YNAMIC RA    | M       |
|----------|--------------|---------|
| 64K      | 200 ns       | \$4.85- |
| 64K      | 150 ns       | 5.25    |
| 16K      | 150 ns       | 1.25    |
|          | <b>EPROM</b> |         |
| 2764     | 250 ns       | \$10.25 |
| 2732     | 450 ns       | 4.15    |
| 2716     | 450 ns       | 3.33    |
| 2532     | 450 ns       | 4.70    |
|          | STATIC RAN   |         |
| 6116P-3  | 150 ns       | \$4.40  |
| 2016     | 100 ns       | 4.00    |
| 2114     | 200 ns       | 1.60    |
| 2        | 80A FAMIL    | 1       |
| CPU, CTO | C, or PIO    | \$ 3.39 |
| DART     |              | 7.50    |
| DMA or S | IO/0         | 13.50   |

MasterCard/VISA or UPS CASH COD All Prime Parts

MICROPROCESSORS UNLIMITED 24,000 South Peoria Ave. BEGGS, OK. 74421

(918) 267-4961 and (918) 267-4796

Circle 274 on Inquiry card.

FOR ONLY \$129.95 Learn Computing From The Ground Up

Build a Computer kit that grows with you, and can expand to 64k RAM, Microsoft BASIC, Text Editor/Assembler, Word Processor, Floppy Disks and more.

# EXPLORER/85

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just \$128.95 you get the advanced-design Explorer/86 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: 8065 Centrol Processing Unit. The microprocessor heart's of our test the 900/8065 this year alone!). Four life high loss for the 1000/8065 this year alone!). Four life high loss for high processor with the second p

coments of the CPU (registers. flags. etc.) . . . and it does much more!
You get all this in the starting level (Level A.) of the Explorer/85 for only \$128-98. Incredibite! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them. see our special offers below.

Level A computer kit (Terminal Version) ... \$129.95 plus \$3 P&L\*!

Level A kit (Hex Keypad/Display Version) ... \$129.95 plus \$3 P&L\*!

plus53 'P&I."

LEVEL B — This "building block" converts the mother-board into a two-siot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.

Level B kir. \$49.95 plus \$2 P&I."

S100 bus connectors (two required) .... \$4.85 each. restraid

postpara.

LEVEL C — Add still more computing power: this "building block" mounts directly on the motherboard and expands the S100 bus to six slots.

Level Ckit ... \$39.95 plus \$2

P&l.\*
☐ S100 bus connectors (five required) . . . \$4.85 each, postpaid.

LEVEL D— When you reach the point in learning that re-quires more memory, we offer two choices: either add 4k to 6 a memory directly on the: motherboard. or add 16k to 64k of memory by means of a single \$100 card. our famous

Devel B kit... \$5.95 plus 50? PAL\*

| Level B kit... \$5.95 plus 50? PAL\*
| Microsoff BASIC. — It's the language that allows you to talk English to your computer! It is available three ways:
| Bk cassel westion of Microsoft BASIC. (requires Level B and 12k of RAM minimum: we suggest a 16k 5100 "AWS".— see above)... \$4.93 ps osphaid.
| Bk ROM version of Microsoft BASIC. (requires Level B ad Level E and & RAM, itsyl bug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k 5100 "AWS"... \$19.95 plus \$12 PAL\*
| Disk version of Microsoft BASIC. (requires Level B, 22k of RAM, hoppy disk controller. 8" floppy disk drive)... \$325 postpaid.

... \$225 postpatd.

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, the ass/mbler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/assembler program is available either in cassette or a ROM version.

Drive Cables (set up for two drives) ... \$25.00 plus \$1.50 P & [.\*

\$1.50 PM.\* \_\_ CP/M\_2.2 Disk Operating System: includes Text Editor/Assembler. dynamic de lugger, and other features that give your Explorer/85 access to thousands of existing CP/M-based programs... \$150.00 postpaid.

CP/M-based programs . . . \$150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/65 (note clisk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet. 1. \$2.35 plus \$2 PA1.\*

NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a culator-type screen. The ner choice is our ASCII yboard/Computer Terminal



4. Plug in Level E here: me-cep1s Microsoft BASIC or Plug in Netronic's Hex Editor/Assemble in ROM syped/Display 5. Add two \$100 boards Add Level B to convert to 6. Add you own custom car-cuits (prototyping core) - Add 4k RAM 7. Commast termbod

a CRT monitor or a TV set (if you have an RF modulator) ☐ Hex Keypad/Display kit . . . . \$69.95 plus \$2 P&l.\*

☐ FASTERM - 64 TERMINAL KIT — Featuring a 56 key ASCII Keyboard, 128 Character set upper and lower case, 75 ohm output, 8 baud rates 50 to 19,200(switch selectable), RS232/C or 20 MA output, 32 or 64 character by 16 kine Iormals, complete with Deltuxe Steel Cabinet and Power Supply, \$199,95 plus \$3 P&I.\*

RF Modulator kit (allows you to use your TV set as a monitor)... \$8.95 postpaid. 1 12" Video Monitor (10MHz bandwidth) ... \$139.95 plus \$5 P&l.\*

plus \$5 P&l.\*
☐ Deluxe Steel Cabinet for the Explorer/85 ... \$49.95 plus \$3 P&l.\* ☐ Fan for cabinel ... \$15.00 plus \$1.50 P&l.\*



#### ORDER A SPECIAL-PRICE EXPLORER/85 PAK — THERE'S ONE FOR EVERY NEED.

☐ Add a Rom-Version Text Editor/Assembler [Requires levels B and D or \$100 Memory]...\$99.95plus \$2 P&J\*.

□ Complete Dan System, Wifeld or Assessed The Septime Sep Fall, Somplete Business Snftware Pak (Save Se25.00) — Includes CP/M 2.2 Microsoft BASIC. General Ledger, Accounts Receivable, Accounts Payable, Payroll Package... (Reg. \$1325) SPECIAL \$699.95 postpaid.

\*P&I stands for "postage & insurance." For Canadian orders, double this amount.

Continental Credit Card Buyers Outside Connecticut:

# TO ORDER Call Toll Free: 800-243-7428

To Order From Connecticut, or For Technical Assistance, Call (203) 354-9375

CP/M is a reg. trademark of Digital Research



SEND ME THE ITEMS CHECKED ABOVE Total Enclosed (Conn. Residents add sales tax): \$.

☐ Personal Check ☐ Cashier's Check/Money Order

□ VISA □ MASTER CARD (Bank No.

Signature. Print Name

NETRONICS Research & Development Ltd.

333 Litchfield Road, New Milford, CT 06776

# ANNOUNCING TWO **NEW TERMINALS**

Smart • Fast • Graphics • Matching Modem and \$295 Printer

Netronics announces a state of the art breakthrough in terminals. Now at prices you can afford, you can go on-line with data-bank and computer phone-line services. It's all yours: "electronic newspapers," educational services, Dow-Jones stock reports, games, recipes, personal computing with any level language, program exchanges, electronic buletin boards... and more every day!!!



Price breakthrough!!! Own the FASTERM-54, a complete terminal kit, ready to plug in for just \$199.95 or order the SMARTERM-80 kit for just \$299.95, (both available wired and tested.) Be on-line with the million-dollar computers and data services today . . . we even supply the

More good news: All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

FASTERM-84... DISPLAY FORMAT: 64 or 32 characters/line by 16 lines ... 96 displayable ASCIi character (upper & lower case) ... & baud rates: 150, 300, 500, 1200, 2400, 4800, 9800, 19, 200, (switch sel), ... LINE OUTPUT: RS232C or 20 ma current loop ... VIDEO OUTPUT: 1V P/P (EIA RS-170) ... CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling ... REVERSE VIDEO ... BLINKING CURSOR ... PARITY off, even or odd ... STOP BITS: 1, 15, 2... DATA BITS PER CHARACTER 5, 6, 7 or 8 ... CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell ... PRINTER OUTPUT: prints all incoming data ... IK ON BOARD RAM ... XC ON BOARD ROM ... CRYSTAL CONTROLLED ... COMPLETE WITH POWER SUPPLY... OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters plus 30 special graphics characters ... ASCI ENCODED KEYBOARD: 56 key126 characters up 30 special graphics SMARTERM-80 ... DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 126 displayable ASCI characters (LINE OF LINE OF LINE) ... DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 126 displayable ASCI characters (LINE OF LINE) ... DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 170 lines 17

SUPPLY.
TELEPHONE MODEM 103 O/A ... FULL DUPLEX, FCC APPROVED ... DATA RATE: 300 baud ... INTERFACE: RS232/C and TTY ... CONTROLS: talk/data switch (no need to connect and disconnect phone), originate/answer switch on rear panel ... NO POWER SUPPLY RE-



Continental U.S.A. Credit Card Buyers Outside Connecticut

## CALL TOLL FREE 800-243-7428

To Order From Connecticut Or For Tech. Assist. Call (203) 354-9375

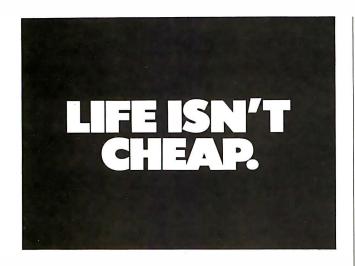
# NETRONICS R&D LTD. Dept.

333 Litchfield Road, New Milford, CT 06776

Please send the items checked below:

| □ COMPLETE FASTERM-64 TERMINAL (Includes FASTVID-64 video board<br>ASCII-3 keyboard, steel cabinet and power supply) kit \$199.95 plus \$3 P&<br>wired & tested \$249.95 plus \$3 P&I graphics option: add \$19.95 to<br>each of above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| □ COMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video<br>DOMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video<br>DOMPLETE SMARTVID-80 VIDEO (SMARTVID-80 VIDE |
| T FASTVID-64 VIDEO BOARD (requires + 5 & 12V DC) kit \$99.95 plus \$3 PAL graphics option add \$19.95 wired & tested \$129.95 plus \$3 PAL graphics option add \$19.95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| SMARTVID-80 VIDEO BOARD (requires + 5 & + /-12V DC) kit \$199.95 plus \$3 P&I wired & tested \$249.95 plus \$3 P&I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| □ DELUXE STEEL TERMINAL CABINET \$19.95 plus \$3 P&I □ ASCII-3 KEYBOARD (requires +5 & -12VDC) kit \$69.95 plus \$3 P&I wired and tested \$89.95 plus \$3 P&I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| ☐ POWER SUPPLY (powers ASCII-3 keyboard & video boards) kit only \$19.95 plus \$2 P&I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| ☐ ZENÎTH VIDEO MONITOR (high resolution green phosphor) wired & tested \$149.95 plus \$6 P&I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| ☐ TELEPHONE MODEM MODEL 103 O/A wired & tested \$189.95 plus \$3<br>P&i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ☐ DOT MATRIX PRINTER Comet 1 wired & tested \$299.95 plus \$10 P&I☐ RF MODULATOR MOD RF-1 kit only \$8.95 plus \$1 P&I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ☐ 3FT-25 LEAD MODEM/TERMINAL OR PRINTER/TERMINAL CONNECTOR<br>CABLE \$14.95 ea plus \$2 P&I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| For Canadian orders, double the postage . Conn. res. add sales tax.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Total Enclosed \$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul> <li>□ Personal Check</li> <li>□ Cashier's Check/Money Order</li> <li>□ VISA</li> <li>□ MasterCard (Bank No.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| ☐ Personal Check<br>☐ VISA ☐ Ma<br>Acct. No | sterCard (B | ank No | ) |
|---------------------------------------------|-------------|--------|---|
| Signature<br>Print Name<br>Address          |             |        |   |
| City                                        | State       | Zip    |   |

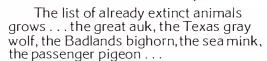


# SHARE THE COST OF

GIVE TO THE AMERICAN CANCER SOCIETY.

THIS SPACE CONTRIBUTED AS A BUBLIC SERVICE

# And then there were none.



What happens if civilization continues to slowly choke out wildlife species by species?

Man cannot live on a planet unfit for

Join an organization that's doing something about preserving our endangered species. Get involved. Write

> the National Wildlife Federation, Department 105, 1412 16th Street, NW. Washington, DC 20036.

> > It's not too late.

LOW LOW COST SUNNY POWER SUPPLIES (LINEAR & SWITCHING) FOR S-100, DISK DRIVES







S-100 & DISK POWER SUPPLIES: OPEN FRAME, ASSY. & TESTED, 6 OUTPUTS, ADJU. & FUSES PROTECT. \$3 For S-100 & Two Disks +24V(OR +12V) ± 16 V +5V OVP SIZE W x D x H 12 SLOT & 2 FLOPPY 5-7A PEAK

(1 Floppy & 1 Hard Disk) 6 SLOT & 2 FLOPPY 4A 1A 4-5A PEAK 8A 3A 83/6" x 5" x 43/4" 92.95 DISK POWER SUPPLIES: OPEN FRAME. ASSY. & TESTED, REGULATED, ADJUSTABLE & FUSES PROTECT

|                  |                          |         | / (IVIL, / (OO 1 . Œ | TEOTED, TIEGOL | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | OTTIBLE GIOCEOTTIOTEOT.                  |       |
|------------------|--------------------------|---------|----------------------|----------------|----------------------------------------|------------------------------------------|-------|
| ITEM             | IDEAL FOR                | +5V OVP | -5V                  | +24V (or +12V) | +8V Unreg.                             | SIZE W x D x H                           | PRICE |
| $\overline{R}_0$ | 2 x 8" SLIM LINE         | 2.5A    |                      | 2.5A - 5A Peak |                                        | 5" x 4" x 4"                             | 49.95 |
| R₁               | 2 x 8" or 2 x 51/4" DISK | 3A      | 1A                   | 3A - 5A Peak   | 2A                                     | 8" x 4" x 3¾"                            | 54.95 |
| $R_2$            | 3x8" (or 51/4") FLOPPY   | 6A      | 1A                   | 6A - 8A Peak   |                                        | 1.8½" x 5" x 45%" or 2. 10" x 4¾" x 334" | 69.95 |
| R <sub>3</sub>   | or 1x Floppy & 1x Hard   | 6A      | 1A                   | 6A - 8 A Peak  |                                        | 1. 9" x 6¼" x 4¾" or 2. 9" x 5¼" x 5¼"   | 69.95 |

OPTION: ±12V @ 1A CAN BE ADDED TO ITEM "R3" SIZE 1. ONLY, COSTS \$12.00 MORE.

S-100 POWER SUPPLY KITS (OPEN FRAME WITH BASE PLATE, 3 HRS. ASSY. TIME)

|       |             |     |     | (0         | .,   |      | ,_ , _, , , _, , , , , , , , , , , , , | , 100 |
|-------|-------------|-----|-----|------------|------|------|----------------------------------------|-------|
| ITEM  | (IDEAL FOR) | +8V | -8V | + 16V      | -16V | +28V | SIZE: WxDxH                            | PRICE |
| KIT 1 | 15 CARDS    | 15A |     | 2.5A       | 2.5A |      | 12" x 5" x 4%"                         | 54.95 |
| KIT 2 | 20 CARDS    | 25A |     | 3 <b>A</b> | 3A   |      | 12" x 5" x 4%"                         | 61.95 |
| KIT 3 | DISK SYSTEM | 15A | 1A  | 3A         | 3A   | 5A   | 13½" x 5" x 4%"                        | 69.95 |

6 SLOT MAINFRAME ASSY. & TESTED ONLY \$399.95 + SHIPPING \$18.00

FOR TWO EA. 8" THINLINE FLOPPY (TANDON TM848-1 SS/DD & TM848-2 DS/DD OR EQUIV.) OR ONE HARD DISK. • 110/220 VAC, 50/60 HZ, EMI FILTER & POWER ON/OFF INDICATOR • POWER SUPPLY: +8V/BA. ± 16V/3A, +5V/5A OVP, -5V/1A & 24V/5A • S-100 BUS 6 SLOT CARD CAGE • 1 EA. AC CORD, 2 EA. DC CABLES WITH POWER CONNECTOR FOR DISK DRIVES • 4.5" COOLING FAN • 7 EA. DB25 CUT-OUTS, 1 EA. 50 PIN & 1 EA. CENTRONIC CUT-OUTS • CUSTOM FINISH & LOGO-LESS, COMPACT SIZE: 12"(W) x 19"(D) x 9.8"(H) 34 LBS

**INQUIRIES** 

\$18.00 IN CANADA. FOR EA. TRANS-FORMER: \$5.00 IN ALL STATES; \$12.00 IN CANADA. CALIF. RESIDENTS ADD 6.5% SALES TAX.

ATTENTION O.E.M.'S YOUR SPECIAL NEEDS DESIGNS OF TRANSFORMER, LINEAR & SWITCHING PWR SUPPLY WILL BE MADE TO ORDER AT SUNNY LOW LOW **COST & FASTEST DELIVERY.** 

SHIPPING FOR EA. PWR SUPPLY: \$5.50 IN CALIF; \$8.00 IN OTHER STATES;



MAILING ADDRESS: P.O. BOX 4296 TORRANCE, CA 90510 TELEX: 182558

SUNNY INTERNATIONAL (TRANSFORMERS MANUFACTURER) (213) 328-2425 MON-SAT 9-6

DEALER

SHIPPING ADDRESS: 221291/2 S. VERMONT AVE TORRANCE, CA 90502



498 BYTE February 1983

# WE WILL NOT BE UNDERSOLD

|                | TERMINALS |          |
|----------------|-----------|----------|
| Zenith ZT-1    |           | \$679.00 |
| Zenith ZT-100  |           | \$595.00 |
| Televideo 910+ |           | \$595.00 |
| Televideo 925  |           | \$779.00 |
| Televideo 950  |           | \$969.00 |
|                |           |          |

# RAM

16K Ram Kit for Apple II, TRS80 200 nano seconds; 4116 chips \$17.50

# **DISKETTES**

Maxell 51/4" single side \$39.00 Maxell 8" single side Maxell 51/4" double side \$49.00 \$45.00 Maxell 8" double side \$55.00 BASF 51/4" \$26.95 BASE 8" \$36.00 Verbatim 51/4" \$26.95 Verbatim 8" \$36.00 514 File Box \$19.95

### **TELECOMMUNICATIONS**

| i III Oo waa daa i i   |          |
|------------------------|----------|
| Novation Cat Modem     | \$139.00 |
| Novation D-CAT         | \$155.00 |
| Novation AUTO-CAT      | \$209.00 |
| Novation APPLE CAT     | \$319.00 |
| Hayes Smart Modem      | \$249.00 |
| Hayes Smart Modem 1200 | \$589.00 |
| Hayes Micro-Modem      | \$319.00 |
| Hayes Chronograph      | \$229.00 |
| Signalman Mark I       | \$85.00  |
|                        |          |

#### COMPUTERS

| OOMI OILIO                                       |      |
|--------------------------------------------------|------|
| Sanyo MBC 100 64K                                | CALL |
| Call for information on the complete Sanyo line. |      |
| Sanyo MBC 1200                                   | CALL |
| Sanyo MBC 2000                                   | CALL |
| Sanyo MBC 3000                                   | CALL |
| Sanyo MBC 4000                                   | CALL |
| Franklin Ace 1000                                | CALL |
| ZENITH                                           |      |
| Z-89 48K                                         | CALL |
| Z-90 64K                                         | CALL |
| Z-100                                            | CALL |
| Call for prices on the complete Zenith line.     |      |

### **SOFTWARE**

| MICROPRO'*          |          |
|---------------------|----------|
| WordStar            | \$379.00 |
| MailMerge           | \$195.00 |
| Customization Notes | \$359.00 |
| SpellStar           | \$195.00 |
| DataStar            | \$259.00 |
| CalcStar            | \$119.00 |
| MICROSOFT           |          |
| Basic Interpreter   | \$349.00 |
| Basic Compiler      | \$389.00 |
| Fortran 80          | \$499.00 |
| Cobol 80            | \$695.00 |
| DATA BASE           |          |
| dBase II            | \$495.00 |

The CPU Computer Corporation Announces:

# **CPU**net

The Local Area Network that uses real CP/M" for Apples. CPUnet" allows you to run hundreds of popular CP/M" programs, on your Apple terminals, without disk drives! Call for more information.

\$2995.00

## **APPLE ACCESSORIES**

| 16K Card by Microsoft                 | \$79.00  |
|---------------------------------------|----------|
| 32K Card by Saturn                    | \$199.00 |
| 64K Card by Saturn                    | \$419.00 |
| 128K Card by Saturn                   | \$585.00 |
| Softcard Plus by Microsoft            | CALL     |
| Keyboard Enhancer II by Videx         | \$125.00 |
| Videoterm by Videx                    | \$259.00 |
| Game Paddles by TG                    | \$49.00  |
| Joystick by TG                        | \$49.00  |
| Pkaso Cards                           | CALL     |
| ALF 3 Voice Board                     | \$229.00 |
| System Saver by Kensington            | \$75.00  |
| Microbuffer II 16K w/graphics         | \$259.00 |
| Microbuffer II 32K w/graphics         | \$229.00 |
| APPLE INTERFACE CARDS BY CCS          |          |
| Serial Asynch #7710                   | \$139.00 |
| Centronics #7729                      | \$149.00 |
| ADVANCED LOGIC                        |          |
| Add-Ram 16K Card                      | \$79.00  |
| Z-Card CP/M for the Apple II          | \$225.00 |
| Smarterm 80 Column Board w/Softswitch | \$249.00 |

#### **APPLE SOFTWARE**

| MICHOPHO'*                |          |
|---------------------------|----------|
| WordStar                  | \$379.00 |
| MailMerge                 | \$190.00 |
| SpellStar                 | \$190.00 |
| DataStar                  | \$259.00 |
| CalcStar                  | \$115.00 |
| VISICORP                  | \$113.00 |
|                           | 6100.00  |
| VisiCalc                  | \$199.00 |
| VisiTerm                  | \$79.00  |
| VisiDex                   | \$199.00 |
| VisiPlot                  | \$169.00 |
| VisiFile                  | \$199.00 |
| VisiSchedule              | \$259.00 |
| VisiTrend/Plot            | \$239.00 |
| MISCELLANEOUS             |          |
| Micro/Terminal            | \$79.00  |
| Screenwriter II           | \$129.00 |
| Executive Briefing System | \$169.00 |
| Supercalc                 | \$279.00 |
|                           | •        |
| Personal Filing System    | \$115.00 |
| PFS Report Writer         | \$75.00  |
| Word Handler              | \$169.00 |
| PFS Graph                 | \$99.00  |
| Multiplan by Microsoft    | \$229.00 |
|                           |          |

# PRINTERS

| NEC 7710 Serial                        | \$2395.00 |
|----------------------------------------|-----------|
| NEC 7720 KSR                           | \$2749.00 |
| NEC 7730 Parallel                      | \$2395.00 |
| NEC 3510 Serial                        | \$1850.00 |
| NEC 3520                               | \$2099.00 |
| NEC 3530 Parallel                      | \$1850.00 |
| NEC 3550 for the IBM PC                | \$2095.00 |
| Antex "Generic Model of the Prowriter" | \$479.00  |
| Epson MX-80                            | CALL      |
| Epson MX-80FT                          | CALL      |
| Epson MX-100                           | CALL      |
| IDS Micro Prism                        | CALL      |
| IDS PRISM 80                           | CALL      |
| IDS PRISM 132                          | CALL      |
| Okidata Microline 80                   | CALL      |
| Okidata Microline 82A                  | CALL      |
| Okidata Microline 83A                  | CALL      |
| Okidata Microline 84                   | CALL      |

SPECIAL OF THE MONTH RANA ELITE THREE 80 TRACK, DOUBLE SIDE DRIVE \$CALL\$

#### **MONITORS**

| Sanyo 9" B&W                         | \$159.00 |
|--------------------------------------|----------|
| Sanyo 9" Green                       | \$165.00 |
| Sanyo 12" B&W                        | \$179.00 |
| Sanyo 12" Green                      | \$199.00 |
| Sanyo 13" Color                      | \$399.00 |
| SMD 13" Color                        | \$329.00 |
| Zenith 12" Green                     | \$99.00  |
| Zenith 13" Color                     | \$339.00 |
| Electrohome 13" HI-RES Color Monitor | \$829.00 |
| Electrohome 13" Color                | \$379.00 |
| Electrohome 12" B&W                  | \$179.00 |
| Electrohome 12" Green                | \$189.00 |
| Electrohome 9" B&W                   | \$149.00 |
| Electrohome 9" Green                 | \$159.00 |
|                                      |          |

#### **DISK DRIVES**

| CCI 100 for the TRS-80 Model 1             |           |
|--------------------------------------------|-----------|
| 51/4" 40 track                             | \$299.00  |
| CCI 189 for the Zenith Z-89 51/4" 40 track | \$379.00  |
| CORVUS 5M with Mirror                      | \$2895.00 |
| CORVUS 10M with Mirror                     | \$4195.00 |
| CORVUS 20M with Mirror                     | \$4895.00 |
| CORVUS Interfaces                          | CALL      |
| RANA SYSTEMS add-on Disc Drive for the     | Apple II  |
| Elite One 40 Track                         | CALL      |
| Elite Two 80 Track                         | CALL      |
| Elite Three                                | CALL      |
| Elite Controller                           | CALL      |
|                                            |           |

### IBM PC ACCESSORIES

| 64K Card by Microsoft        |   | \$299.00 |
|------------------------------|---|----------|
| 128K Card                    |   | \$469.00 |
| 192K Card                    |   | \$599.00 |
| 256K Card                    |   | \$789.00 |
| Quaddram                     |   | CALL     |
| Joystick by TG               |   | \$49.00  |
| Combo Card by Apparat        | , | \$249.00 |
| Tandon TM 100-2 for the IBM  |   | CALL     |
| Call for more IBM PC add-one |   |          |

#### **IBM PC SOFTWARE**

| INFORMATION UNLIMITED                      |          |
|--------------------------------------------|----------|
| Easy Writer                                | \$289.00 |
| Easy Speller                               | \$149.00 |
| Easy Filer                                 | \$319.00 |
| VISICORP                                   |          |
| VisiCalc 256K                              | \$199.00 |
| VisiFile                                   | \$219.00 |
| VisiTrend/VisiPlot                         | \$259.00 |
| VisiDex                                    | \$209.00 |
| VisiTerm                                   | \$99.00  |
| MICROPRO**                                 |          |
| MailMerge                                  | \$195.00 |
| WordStar                                   | \$379.00 |
| MISCELLANEOUS                              |          |
| Supercalc by Sorcim                        | \$279.00 |
| Superwriter by Sorcim                      | \$289.00 |
| Home Accounting Plus                       | \$139.00 |
| ENTERTAINMENT                              |          |
| Deadline                                   | \$39.00  |
| Temple of Apshai                           | \$29.00  |
| Curse of Ra                                | \$15.99  |
| Call For More IBM Software And Accessories |          |

CP/M is a registered trademark of Digital Research.

# TO ORDER CALL TOLL FREE 1-800-343-6522

For fast delivery, send certified checks, money orders, or call to arrange direct bank wire transfers. Personal or company checks require one to three weeks to clear. All prices are mail order only, and are subject to change without notice. Call for shipping charges.



# The CPU Shop



420-438 Rutherford Ave., Dept. BY14, Charlestown, Massachusetts 02129

# TRUE MAIL ORDER PRICES

With so many so-called Mail Order establishments using "toll free" lines, and grandiose advertising, how can you, the customer, expect to receive true mail order savings? We have done away with large ads, and free phone lines to offer comparable service passing on the savings to you.

**THINK!** You still SEND YOUR MONEY in the mail to an unknown untested party, and delivery is still often doubtful and certainly protracted in most cases.

| PRINTERS                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OKIDATA           80 no Iractor         \$ 319           80 with Iractor         \$ 369           82A no Iractor         \$ 419           82A with Iractor         \$ 459           83A         \$ 669           84A parallel         \$ 1009           84A senal         \$ 1119           2K Buffer         \$ 500 |
| Graphics 82A, 83A \$ 73 C4TOH SPECIAL Comet II (125 cps) \$ 499 Full 15' width text printer                                                                                                                                                                                                                          |
| C-ITOH PRINTERS  80 col. parallel printer \$ 449  80 col. serial printer \$ 589  132 col. parallel printer \$ 579  132 col. serial printer \$ 729                                                                                                                                                                    |
| Prac. Peripheral 8K Serial Buffer with X on/off Epson                                                                                                                                                                                                                                                                |
| STAR PRINTERS Gemini 10 and 15                                                                                                                                                                                                                                                                                       |

| LETTER QUALITY  serial or parallel                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C-ITOH F10                                                                                                                                                                                                                                                                                           |
| PRINTER                                                                                                                                                                                                                                                                                              |
| CONNECTORS                                                                                                                                                                                                                                                                                           |
| TRS-80 Cabies only \$ 22 Apple Int & Cable \$ 79 Atari-printer Cable \$ 24 IBM PC-printer Cable \$ 24 Mate Centronics-printer Cable \$ 24 RS232 mate-male \$ 19 "Configured for any computer, please specify your computer" IDS Cable \$ 33 Apple Graphics Card with Cable to Epson NEC C-1TOH \$ 89 |
| MONITORS                                                                                                                                                                                                                                                                                             |
| Zenith ZVM-121 Green                                                                                                                                                                                                                                                                                 |

| IBM                                                                                                                                                                                                                    |                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Monte Carlo Card 64K                                                                                                                                                                                                   | \$ 399<br>\$ 69                                                 |
| VERBATIM 51/4" SSSD 51/4" SSDD 51/4" SSDD 6" DSDD 8" DSDD 8" SSDD Available in soft sector and hard sect                                                                                                               | \$22.50<br>\$24.00<br>\$35.00<br>\$39.00<br>\$35.00<br>or 10/16 |
| IBM/APPLE DRIV  Tandon TMS-100-1 TMS-100-2 TMS-100-2 TMS-100-4 Software patch for IBM RANA Eitle 1 Add on Drive Ouad drive Apple controller For Eitle 2/3/4 write for price availability DAVONG (Apple and IBM) 5 MB 5 | \$202<br>\$265<br>\$383<br>\$ 66<br>\$333<br>\$ 99              |
| 10 MB                                                                                                                                                                                                                  | . \$2025                                                        |

| NEC                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| PERSONAL COMPUTER PC-8001 PC-8012 PC-8031 COMINGI—NEW NEC-APC                                                                                          |
|                                                                                                                                                        |
| GENERIC DISKETTES                                                                                                                                      |
| 5 <sup>1</sup> /4" SS/SD in plastic library case \$21                                                                                                  |
| Library Cases Alone \$ 2.50 8" \$ 3.50 <b>MODEMS</b>                                                                                                   |
| Hayes Smart Modem   \$212     Hayes Micro Modem   \$259     Hayes Chronograph   \$179     Apple - Cat II   \$279     IBM - Smart Modem Cables   \$22   |
| RAM CARDS                                                                                                                                              |
| Apple 16K Card         \$ 66           32K Card         \$125           IBM 64K Quad Board         \$375           Apple Vista Vision 80         \$242 |

Send orders and inquiries to:

# Computer Apparatus™

P.O. Box 32063 • Aurora, CO 80041

TELEPHONE ORDER INQUIRIES: (303) 759-9251

10 a.m. to 2 p.m. Mountain Time. Monday to Friday.

We have access to a vast range of computer products from the many stocking distributors in Denver. We cater for a range of brand name peripherals and software for TRS-80, Apple, IBM, Atari and CP-M users. SEND in a card stating your interests for our free catalog.

DELIVERIES: 4-6 weeks at worst, all orders are fully dated. (Includes mail and shipping time).

PERSONAL CHECKS: OKAY, but cashiers checks, money orders, etc., will receive shipping preference
VISA AND MASTERCARD: Add 4% to total we CHARGE only WHEN we SHIP.

CATALOG: Descriptions charts pricing and availability on all our products. Prices subject to change without notice
SHIPPING: VIA UPS add \$2.00 plus 1% of order total.

All brands are registered trademarks.

Please Circle Inquiry Card to Receive Our Comprehensive Catalog

# Best Price • Good Quality • Swift Delivery • Export

| LNW 8 0 I | *The Best Graphic Personal Computer* \$ ZBOA, 65K, 480 x 192 1,250 WCP/M board |
|-----------|--------------------------------------------------------------------------------|
|           | Multiuser Business/Engineer*                                                   |
| CROMEMCO  |                                                                                |
| CS1       | 5%" floppy, Z80                                                                |
| CS1H      | W/5 M8 hard disk,5,247                                                         |
| CS1D2E    | 258K RAM, 88000 & Z80                                                          |
|           | two 5%" floppy4,087                                                            |
| CS1D2     | no error correction 3,747                                                      |
| CS3D5E    | 512K RAM, 6800 & Z80                                                           |
| C10       | two 8" floppy                                                                  |
| CIO       | Z80A, keyboard1,090                                                            |
|           | 200.4 10,000.0                                                                 |
|           | *Professional/Word Process*                                                    |
| ZENITH    | Z90-80, 64K                                                                    |
| NORTH     | HORIZON, 1 quad drive, HD53,999                                                |
| STAR      | ADVANTAGE, 2                                                                   |
|           | quad drives, 64K 2,999                                                         |
| CROMEMCO  |                                                                                |
| CIO       | floppy, letter quality printer,                                                |
|           | CP/M type O.S. + word processing                                               |
|           | + spreadsheet 2,600                                                            |
|           | Zenith 16-Bit                                                                  |
| Z-110     | dual drives, 128K RAM color board,                                             |
|           | 225 x 640 graphic, IBM PC                                                      |
|           | compatible 2,998                                                               |
| ZVM-134   | superb color monitor 528                                                       |
|           | *16-bit CPU*                                                                   |
| WICAT     | S150 1FS 1-user                                                                |
|           | 256K RAM, CRT, 2 floppies                                                      |
| .08000    | S150 WS 1-user 8,999                                                           |
|           | 256K RAM, 10MB hard disk,                                                      |
|           | 960KB floppy CRT, OS + 1 language<br>S150-3 WS 3-users 10.800                  |
|           | same as S150 WS                                                                |
|           | S150-6 WS 6-users 12,800                                                       |
|           | 512K RAM same as S150 WS                                                       |
|           | Graphics 300 × 400 900                                                         |
| DUAL      | 68000, 51 2K RAM, 20MB hard disk,                                              |
| AL TOC    | IBM floppy, UNIX, \$10014,500                                                  |
| ALTOS     | ACS8600-12 500K RAM 20MB<br>hard disk9,750                                     |
|           | Business System Software 1,995                                                 |
| TERAK, SW | TPC, TELEVIDEO, NEC Call                                                       |
|           |                                                                                |
|           |                                                                                |

COMPUTER

| EPSON                                                     | \$<br>MX80 F/T Graftrax                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integral Data<br>MICROPRISM                               | System 75 cps excellent print/110 cps 84 ×84 graphic, RS232/parallel                                                                                                                                                                                                                                                                                                                                     |
| PRISM 80                                                  | pin & friction feed                                                                                                                                                                                                                                                                                                                                                                                      |
| PRISM 132                                                 | 200 cps, 13 2 col                                                                                                                                                                                                                                                                                                                                                                                        |
| TI<br>OKIDATA<br>PRINTEK 920                              | 810 Superb                                                                                                                                                                                                                                                                                                                                                                                               |
| C.ITOH<br>QUME<br>DIABLO<br>BROTHER<br>NEC                | *Letter Quality*  Starwriter F-10 40 cps. 1,395 9145 1,840 620 1,288 HR-1 Parallel 950 7710 2,299 3550 1,945                                                                                                                                                                                                                                                                                             |
|                                                           | TERMINAL                                                                                                                                                                                                                                                                                                                                                                                                 |
| ZENITH                                                    | Z19 smart terminal                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                          |
| BEEHIVE<br>IBM<br>TELEVIDEO<br>VISUAL                     | III.     .788       DM5 A.     .995       3101-10.     .1,295       970.     .1,119       300.     .948                                                                                                                                                                                                                                                                                                  |
| IBM<br>TELEVIDEO                                          | DM5 A                                                                                                                                                                                                                                                                                                                                                                                                    |
| IBM<br>TELEVIDEO                                          | DM5 A                                                                                                                                                                                                                                                                                                                                                                                                    |
| IBM<br>TELEVIDEO<br>VISUAL<br>ZENITH                      | DMS A                                                                                                                                                                                                                                                                                                                                                                                                    |
| IBM<br>TELEVIDEO<br>VISUAL<br>ZENITH<br>AMDEK             | DM5 A                                                                                                                                                                                                                                                                                                                                                                                                    |
| IBM TELEVIDEO VISUAL  ZENITH AMDEK  SANYO NEC Electrohome | DM5 A     .995       3101-10     .1.295       970     .1.119       300     .948       MONITOR       12" green     .114       COLOR IV 720 × 400     .1.050       COLOR II RGB 13"     .725       COLOR II 13"     .340       300 G 12" green     .169       13" RGB     .875       12" green     .170       1203 RGB     .725       RGB 580 × 235     .599       MODEM       martmodem 300 baud     .220 |
| IBM TELEVIDEO VISUAL  ZENITH AMDEK  SANYO NEC Electrohome | DM5 A                                                                                                                                                                                                                                                                                                                                                                                                    |

|   | IBM PC                                                                                                                                                                                                                                                                                                                                                                                            |  |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|   | AMDEK 310 monitor. 189 IDS Microprism 480. 525 EPSON MX 80 F/T 520 NEC 3550 letter quality 1,945 C.ITOH F-10 40cps. 1,395 Microsoft 128K RAM. 360 EASY WRITER II IUS. 255 CP AIDS Master Tax. 1,195 LEGAL TIMEKEEPING STAR. 725 Digital Research Pascal MT+86. 310 Concurrent CP/M 86, 299 Peachtree GL, AR, AP. 330 Structured Systems Accounting. 700                                           |  |
| ı | DIGITIZER/PLOTTER                                                                                                                                                                                                                                                                                                                                                                                 |  |
|   | HOUSTON INSTRUMENT HI PAD DIGITIZER DT-11 11"×11"                                                                                                                                                                                                                                                                                                                                                 |  |
| ı | DISK DRIVE                                                                                                                                                                                                                                                                                                                                                                                        |  |
| I | Mitsubishi 8" DD, DS bare 410                                                                                                                                                                                                                                                                                                                                                                     |  |
| I | dual 8" subsystem                                                                                                                                                                                                                                                                                                                                                                                 |  |
| 1 | SOFTWARE                                                                                                                                                                                                                                                                                                                                                                                          |  |
|   | ### dBASE II Ashton-Tate database. 499 CONDOR II. 450 MICROSOFT BASIC 80. 285 MIcro Pro WORDSTAR. 295 MILMERG 105 Digital Research CPM 2.2 139 Accounting Plus System Plus. 399                                                                                                                                                                                                                   |  |
| ١ | CALL (212) 937-6363                                                                                                                                                                                                                                                                                                                                                                               |  |
|   | free catalogue  Prices subject to change. American Express, Visa/ Mastercard add 3%. F.O.B. point of shipment. 20% re- stocking fee for returned merchandise. Personal checks take 3 weeks to clear. COD on certified check only. N.Y. residents add sales tax. Manufacturers' warranty only. International customers, please confirm price before order. Accept P.O. from Fortune 500 & schools. |  |
|   |                                                                                                                                                                                                                                                                                                                                                                                                   |  |

Long Island City, NY 11101

CSTNY

# 8" Disk Drive Double-Density \$249.95

# 8" Disk Drives

| Slemens FDD 100-8         single-sided double-density           MSF-201120         \$274.95 ea         2 for \$249.95 ea                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shugart         SA810         half-size         single-sided         double-density           MSF-108100         \$424.95         ea         2 for \$394.95         ea |
| Shugart SA860 half-size double-sided double-density MSF-108600                                                                                                         |
| Shugart SA801R         single-sided double-density           MSF-10801R         \$394.95 ea         2 for \$389.95 ea                                                  |
| Shugart SA851R         double-sided double-density           MSF-10851R         \$554.95 ea         2 for \$529.95 ea                                                  |
| Tandon TM848-1         single-sided double-den thin-line           MSF-558481         \$379.95 ea         2 for \$369.95 ea                                            |
| Tandon TM848-2 double-sided double-den thin-line MSF-558482 \$494.95 ea 2 for \$484.95 ea                                                                              |
| Qume DT-8         double-sided double-density           MSF-750080         \$524.95         ea         2 for \$498.95         ea                                       |

# 51/4" Disk Drives

| 374 Disk Dilves                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------|
| Tandon TM100-1 single-sided double-density 48 TPI MSM-551001                                                                  |
| Shugart SA400L single-sided double-density 40 track MSM-104000                                                                |
| Shugart SA455         hall-size double-sided 48 TPI           MSM-104550         \$349.95 ea         2 for \$329.95 ea        |
| Shugart SA465         half-size doule-sided 96 TPI           MSM-104650         \$399.95 ea         2 for \$379.95 ea         |
| Tandon TM100-2         double-sided double-density 48 TPI           MSM-551002         \$294.95 ea         2 for \$269.95 ea  |
| Shugart SA450 double-sided double-density 35 track MSM-104500\$349.95 ea 2 for \$329.95 ea                                    |
| Tandon T M100-3         single-sided double-density 96 TPI           MSM-551003         \$294.95 ea         2 for \$269.95 ea |
| Tandon T M100-4         double-sided double-density 96 TPI           MSM-551004         \$394.95 ea         2 for \$374.95 ea |
| MPI B-51 single-sided double-density 40 track MSM-155100                                                                      |
| MPI B-52         double-sided double-density 40 track           MSM-155200         \$344.95 ea         2 for \$334.95 ea      |
| 51¼" Cabinets with Power Supply END-000216 Single cab w/power supply \$69.95                                                  |

# Place Orders Toll Free

END-000228 Dual cab w/power supply ...... \$94.95

Continental U.S.

Inside California

800-421-5500

800-262-1710

For Technical Inquires or Customer Service call:

213-973-7707

# Computer Products

4901 W. Rosecrans, Hawthorne, CA 90250

We accept cash, checks, credit cards, or Purchase Orders from qualified firms & institutions. Minimum prepaid order \$15 California residents add 6½% tax. Export customers outside the US or Canadaplease add 10% to all prices. Prices and evailibility subject to change without notice. Shipping & handling charges via UPS Ground 50¢/lb, UPS Air \$1.00/lb minimum charge \$3.00

# **Dual Disk Sub-Systems**

#### Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

**Dual 8" Sub-Assembly Cabinet** 

| END-000420                                    | Bare cabinet , , \$49.95               |  |
|-----------------------------------------------|----------------------------------------|--|
| END-000421                                    | Cabinet kit \$199.95                   |  |
| END-000431                                    | A & T\$249.95                          |  |
| 8" Sub-                                       | Systems - Single Sided, Double Density |  |
| END-000423                                    | Kit w/2 FD100-8Ds \$650.00             |  |
| END-000424                                    | A & T w/2 FD100-8Ds \$695.00           |  |
| END-000433                                    | Kit w/2 SA-801Rs \$999.95              |  |
| END-000434                                    | A & T w/2 SA-801Rs \$1195.00           |  |
| 8" Sub-Systems - Double Sided, Double Density |                                        |  |
| END-000426                                    | Kit w/2 DT-8s \$1224.95                |  |
| END-000427                                    | A & T w/2 DT-8s \$1424.95              |  |
| END-000436                                    | Kit w/2 SA-851Rs \$1274.95             |  |
| END-000437                                    | A & T w/2 SA-851Rs \$1474.95           |  |

# 8" Slimline Sub-Systems

#### Dual Slimline Sub-Systems - Jade

Handsome vertical cabinet with scratch resistant baked enamel finish, proportionally balanced airflowsystem, quiet cooling fan, rugged dual drive power supply, power cables, power switch. line cord, fuse holder, cooling fan, all necessary hardware to mount 2-8" slimlinediskdrives, does not include signal cable.

**Dual 8" Slimline Cabinet** 

| END-000820 | Bare cabinet \$59.95         |
|------------|------------------------------|
| END-000822 | A & T w/o drives \$179.95    |
|            | Dual 8" Silmline Sub-Systems |
| END-000823 | Kit w/2 TM848-1 \$919.95     |
| END-000824 | A & T w/2 TM848-1 \$949.95   |
| END-000833 | Kit w/2 TM848-2 \$1149.95    |
| END-000834 | A & T w/2 TM848-2 \$1179.95  |
|            |                              |

# Modems

# SIGNALMAN - Anchor

Direct-connect automatic answer/originate selection, 300
Baud full duplex, Bell 103, includes RS-232 cable, portableperfect for Osborne or KayPro II
IOM-5600A Signalman \$89.95

#### SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

| IOM-5400A | Smartmodem                | \$224.95 |
|-----------|---------------------------|----------|
| IOK-1500A | Hayes Chronograph         | \$218.95 |
| IOM-2010A | Micromodem II w/Term prgm | \$329.95 |
| IOM-2012A | Terminal program for MMII | \$89.95  |
| IOM-1100A | Micromodem 100            | \$368.95 |

# 1200 BAUD SMARTMODEM - Hayes

1200 and 300 baud, all the features of the standard Smartmodem plus 1200 baud, 212 compatible, full or half duplex.

IOM-5500A Smartmodem 1200 ...... \$599.95

## 1200 BAUD SMART CAT - Novaton

103/212 Smart Cat & 103 Smart Cat, 1200 & 300 baud, built-in dialer, auto re-dial if busy, auto answer/disconnect, direct connect, LED readout displays mode, analog/digital loop-back self tests, usable with multi-line phones.

| IOM-5241A | 300 baud 103 Smart Cat      | \$229.95 |
|-----------|-----------------------------|----------|
| IOM-5251A | 1200 baud 212/103 Smart Cat | \$549.95 |
| IOM-5261A | 300 baud 103 J-Cat          | \$129.95 |

Circle 217 on inquiry card.

# Printers on Sale



#### PRINTER PRICES SLASHED !!!

High speed dot matrix printers with all the features of the higher-priced best-selling machines for a fol less money!!! 100 CPS, 9 x 9 dot matrix with true lower case descenders, high-resolution bit image and block graphics, superscript & subscript, underlining, backspacing, double strike and emphasized print modes, proportional space font, friction feed, tractor feed, and roll paper, 5, 6, 8½, 10, 12, & 17 pitch, programable line spacing, FREE 2.3K butter, Epson pin and plug compatible, user replaceable print head, extended 6 month factory warranty.

| PRM-66010 | 10" wide carriage \$439.95    |
|-----------|-------------------------------|
| PRM-66015 | 15" wide carriage \$569.95    |
| PRA-66100 | Apple card & cable \$45.00    |
| PRA-66200 | Serial interface card \$69.95 |

#### HIGH-SPEED, HIGH QUALITY - Okidata

Microline 82A 80/132 column, 120 CPS, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking, both setial & parallel Interfaces Included, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics

| 0400 0000011 | doro di grapino   |          |
|--------------|-------------------|----------|
| PRM-43082    | with FREE tractor | <br>CALL |

| PRM-43084  | Centronics parallel      | CALL     |
|------------|--------------------------|----------|
| PRM-43()85 | Serial with 2K buffer    | CALL     |
| PRA-27081  | Apple card               | \$39.95  |
| PRA-27082  | Apple cable              | \$19.95  |
| PRA-27087  | TRS-80 cable             | \$24.95  |
| PRA-43081  | 2K hi speed serial card  | 149.95   |
| PRA-43082  | Hi-res graphics ROMs 82A | \$49.95  |
| PRA-43083  | Hi-graphics ROMs 83A     | \$49.95  |
| PRA-43088  | Tractor option for 82A   | \$49.95  |
| PRA-43080  | Extra ribbons pkg. of 2  | . \$9.95 |
|            |                          |          |

#### 8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.

| michon 1880.            |          |
|-------------------------|----------|
| NEC-8023A 8023 parallel | \$499.95 |
| NEC-8023-01 8023 ribbon | \$11.95  |

# **Letter Quality Printers**

#### **LETTER QUALITY PRINTER - Jade**

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or lan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

| PRD-11001 | Centronics parallel  | \$899.95 |
|-----------|----------------------|----------|
| PRD-11002 | RS-232C serial model | \$969.95 |
| PRA-11000 | Tractor Option       | \$119.95 |

## STARWRITER F-10 - C. Itoh

New 40 CPS daisy wheel printer with full 15" carriage, uses standard Diablo print wheels and ribbons, both parallel and serial interfaces included.

PRD-22010 Starwriter F-10 ..............\$1495.95

# TP-1 LETTER QUALITY - SCM

| 12 CPS dais | y wheel printer from Smith Corona. |          |
|-------------|------------------------------------|----------|
| PRD-45101   | Centronics parallel                | \$648.95 |
| PRD-45102   | RS-232C serial                     | \$648.95 |

## PRINTER PALS - F.M.J. Inc.

| Desk top pr | inter stand and continuous form paper h | older.  |
|-------------|-----------------------------------------|---------|
| PRA-99080   | for MX-80, MX-80FT, Oki 82A, NEC        | \$29.95 |
| PRA-99100   | for MX-100, Oki 83A & 84                | \$34.95 |
| PRA-99700   | for letter quality printers             | \$49.95 |

# Disk Drive for Apple II \$269.95

# Apple II Accessories

# APPLE DISK DRIVE - Apple Compatible

Totally Apple compatible, 143,360 bytes per drive on DOS 3.3, track 0 microswitch, high speed lead screw positioner, full one year factory warranty, half-track capability - reads all Apple software, plugs right in to Apple controller as second drive, DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

| MSM-123200 | Add-on Apple Drive   | \$279.95 |
|------------|----------------------|----------|
| MSM-123100 | Controller w/DOS 3.3 | \$99.95  |

### 16K RAM CARD - for Apple II

# Z-CARD for Apple II - A.L.S.

### **SMARTERM II - A.L.S.**

80 column x 24 line video card for Apple II, addressable 25th status line, normal/inverse or high/low video, 128 ASCII characters, upper and lower case, 7 x 9 dot matrix with true descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz, 40/80 column selection from keyboard

| IOV-2500A | ALS Smarterm II |  | \$179.95 |
|-----------|-----------------|--|----------|
|-----------|-----------------|--|----------|

#### SERIAL I/O CARD - A.L.S.

## **MODEM CARD for APPLE — SSM**

Better than Hayes!! Better than Novation!! Direct connect ModemCard plugs directly into Apple - no external components, auto-dial, auto-answer, Bell 103 compatible, full and half duplex, touch-tone or pulse dialing generated on board, Micromodem II software compatible, displays modem information on screen, audio monitoring of phone line, no serial port required, two year factory warranty, FREE Source Subsription with purchase of Transend software.

| IOM-3000A Mod | lemCard             | \$289.95 |
|---------------|---------------------|----------|
| SFA-55770010M | Transend 1 w/Source | \$79.95  |
| SFA-55770020M | Transend 2 w/Source | \$129.95 |
| SFA-55770030M | Transend 3 w/Source | \$239.95 |

### 2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

| 1 MegaByte Package | Kit   | \$1495.00 |
|--------------------|-------|-----------|
| 1 MegaByte Package | A & T | \$1695.00 |
| 2 MegaByte Package | Kit   | \$1795.00 |
| 2 MegaByte Package | A & T | \$1995.95 |

# **EPROM Erasers**

# **ULTRA-VIOLET EPROM ERASERS**

| Inexpensive erasers for industry or home. |                        |               |         |
|-------------------------------------------|------------------------|---------------|---------|
| XME-3100A                                 | Spectronics w/o timer  |               | \$69.50 |
| XME-3101A                                 | Spectronics with timer |               | \$94.50 |
| XME-3200A                                 | Economy model          | . <b>. </b> . | \$39.95 |

# JADE Computer Products

# IBM PC Accessories

# ADD ON DISK DRIVE for IBM PC- Tandon

Single sided or double sided, double density disk drives for IBM PC, these are exactly the same disk drives used by IBM at half the price

| MSM-551001 | TM100-1 single sided | \$219.95 |
|------------|----------------------|----------|
| MSM-551002 | TM100-2 double sided | \$294.95 |

# SERIAL I/O for IBM PC - Profit Systems

|           | ncludes software  | 110 010011 |
|-----------|-------------------|------------|
| IOI-8100A | Card with 1 port  | \$159.95   |
| IOI-8101A | Card with 2 ports | \$199.95   |

## SERIAL/PARALLEL for IBM PC - Profit Sys

| Two asynchronous serial RS-232C I/O ports, one p        | arall |
|---------------------------------------------------------|-------|
| printer I/O port, real time clock-calender, includes so | ftwa  |
| IOI-8110A 1 serial & 1 parallel \$                      | 199.9 |
| IOI-8111A 2 serial & 1 parallel \$                      | 229.9 |
| ·                                                       |       |

#### TASC MASTER for IBM PC - Profit Systems

|           | 1 serial/parallel/64K | \$399.95     |
|-----------|-----------------------|--------------|
| IOI-8122A | 2 serial/parallel/16K | <br>\$359.95 |
| IOI-8123A | 2 serial/parallel/64K | <br>\$429.95 |

# **EXTENDER CARD for IBM PC - Profit System**

| All bus signals extended, signal names silk screened on top |                 |         |  |
|-------------------------------------------------------------|-----------------|---------|--|
| of board, gold-plated card edge, low noise                  |                 |         |  |
| TSX-300A                                                    | IBM PC extender | \$45.00 |  |

# PROTOTYPING CARD for PC - Profit Systems

Highly versatile wire-wrap or solder prototyping board for your IBM PC, large bread board area, power and ground planes to reduce noise, all holes are plated through, card is solder masked on both sides, all signals names are silk screened on both sides

| TSX-310A |  | \$59.95 |
|----------|--|---------|
|----------|--|---------|

#### 512K PC/RAM STACK - Hammond

A high quality, high density memory expansion board for your PC, cool-quiet-reliable operation, full parity checking, unique stacking sockets, expandable from 256K to 512K, MDRIVE high speed RAMdisk software only \$25.00 with board purchase

| MEX-25600A | 256K Assembled & tested | \$795.00  |
|------------|-------------------------|-----------|
| MEX-51200A | 512K Assembled & tested | \$999.95  |
| MEX-25600S | MDRIVE disk emulator    | . \$25.00 |

# 256K PC/RAM - Hammond Engineering

User expandable from 64K to 256K, same high quality as RAM STACK above, designed to meet all your medium memory expansion requirements

| memory expan | ision requirements      |          |
|--------------|-------------------------|----------|
| MEX-64000A   | 64K Assembled & tested  | \$299.95 |
| MEX-128000A  | 128K Assembled & tested | \$399.95 |
| MEX-192000A  | 192K Assembled & tested | \$499.95 |
| MEX-256000A  | 256K Assembled & tested | \$569.95 |
|              |                         |          |

# PC/SASI RAM - Hammond Engineering

Three boards in one, 256K of RAM, RS-232C asynchronous serial interface, and a SASI (Shugart Associates Standard Interface) hard disk interface
IOX-6000A PC/SASI RAM ......\$1095.00

Circle 218 on inquiry card.

# **Video Monitors**

# HI-RES 12" GREEN SCREEN - Zenith

15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable. VDM-201201 List price \$189.95 .....\$115.95

# HI-RES GREEN MONITORS - NEC

20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor, high quality, extremely reliable. VDM-651200 Deluxe 12" \$199.95 VDM-651260 Economy 12" \$149.95 VDM-65092 Deluxe 9" \$179.95

#### 12" COLOR MONITOR - NEC

| High resolution color monitor with audio. |          |
|-------------------------------------------|----------|
| VDC-651212 Color monitor                  | \$389.95 |
| NEC-1202D RGB color monitor               | \$999.95 |

#### 12" COLOR MONITORS - Taxan

#### COLOR MONITORS - Amdek

| Reasonably priced color video monitors. |          |
|-----------------------------------------|----------|
| VDC-80130 13" Color I                   | \$379.95 |
| VDC-801320 13" Color II                 | \$894.95 |
| IOV-2300A DVM board for Apple           | \$199.95 |
|                                         |          |

#### **AMBER or GREEN MONITORS - Jade**

 High resolution 18 MHz compact video monitors.

 VDM-751210
 12" Amber phosphor
 \$149.95

 VDM-751220
 12" Green phosphor
 \$139.95

 VDM-750910
 9" Amber phosphor
 \$149.95

 VDM-750920
 9" Green phosphor
 \$139.95

# Single Board Computer

### SUPERQUAD - Adv. Micro Digital

Single board, standard size S-100 computer system, 4 MHz Z-80A, single or double density disk controller for 5½" or 8" drives, 64K RAM, extended addressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible.

| CPC-30800 | A A & T   |           |   | <br>. \$724.9 |
|-----------|-----------|-----------|---|---------------|
| IOX-4232A | Serial I/ | O adapter | · | <br>\$29.9    |

# Z-80 STARTER KIT - SD Systems

# S-100 EPROM Boards

# PB-1 - SSM Microcomputer

#### PROM-100 - SD Systems

 2708, 2716, 2732 EPROM programmer with software.

 MEM-99520K Kit with software
 \$189.95

 MEM-99520A A & T with software
 \$249.95

# S-100 MotherBoards

# ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard 6 Slot (51/4" x 85/6")

| MBS-061B                | Bare board \$22.95       |  |  |  |
|-------------------------|--------------------------|--|--|--|
|                         | Kit \$39.95              |  |  |  |
| MBS-061A                | A & T                    |  |  |  |
| 12 Slot (93/4" x 85/6") |                          |  |  |  |
| MBS-121B                | Bare board \$34.95       |  |  |  |
| MBS-121K                | Kit \$69.95              |  |  |  |
| MBS-121A                | A & T \$109.95           |  |  |  |
|                         | 18 Slot (141/2" x 85/8") |  |  |  |

MBS-181B Bare board ...... \$54.95

# 

A true mother's helper.

TSX-100A A & T ...... \$59.45

# New !!! CP/M Plus 3.0

# NEW CP/M 3.0 - Digital Research

CP/M 3.0 is Digital Research's latest version of the industry standard disk operating system. It features many performance improvements such as intelligent record buffering, improved directory handling, "HELP" facility, time/date stamping of files and many more improvements. AND A TREMENDOUS INCREASE IN SPEED!!!. it is fully CP/M 2.2 compatible and requires no changes to your existing application software. Available only to Versafloppy II owners with SBC-200 CPU's

- CP/M 2.2 compatible
- Easily customized
- Easier to learn and use
- High performance file system
- Time and date stamps on file
- Automatic disk log-in of removable media
- Support for 1 to 16 banks of RAM
- Supports up to 16 drives of 512 Megabytes each
- Up to ten times faster than CP/M 2.2
- Console I/O re-direction
- Easy to use system utilities with HELP facility
- Power batch facility
- Designed for application programmers
- Resident system extensions
- Sophisticated programmer utilities
- Designed with the business user in mind

| SFC-55009057D | CP/M 3.0 manual se | t     | . \$30.00 |
|---------------|--------------------|-------|-----------|
| 5FC-55009057F | CP/M 3.0 8 WITH Ma | nuais | \$200.00  |

# S-100 Memory Boards

# 256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software.

| MEM-65064A   | 64K A & I                 | \$474.95 |
|--------------|---------------------------|----------|
| MEM-65128A   | 128K A & T                | \$574.95 |
| MEM-65192A   | 192K A & T                | \$674.95 |
| MEM-65256A   | 256K A & T                | \$774.95 |
| SFC-55009000 | OF RAMDISK sftwr CP/M 2.2 | \$44.95  |
| SFC-55009000 | OF RAMDISK with EXRAM III | \$24.95  |

# 64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma.

| MEM-99152B  | Bare board \$49.95   |
|-------------|----------------------|
| MEM-99152K  | Kit less RAM \$99.95 |
| MEM-32152K  | 32K kit\$199.95      |
| MEM-56152K  | 56K kit\$289.95      |
| MEM-64152K  | 64K kit\$299.95      |
| Assembled & | Tested add \$50.00   |

# 16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A 16K A & T ..... \$149.95

# S-100 Disk Controllers

# DISK 1 - CompuPro

| 8" or 5'/4" DMA disk controller, single or double | aensity, |
|---------------------------------------------------|----------|
| single or double sided, 10 MHz.                   |          |
| IOD-1810A A & T                                   | \$449.95 |
| IOD-1810C CSC                                     | \$554.95 |

# **VERSAFLOPPY II - SD Systems**

Double density disk controller for any combination of 51/4" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts, CP/M 2.2 & Oasis compatible, control/diagnostic software PROM included. IOD-1160A A & T with PROM .. .....\$359.95 SFC-55009047F CP/M 3.0 with VF II ...... \$99.95

# 2242 DISK CONTROLLER - C.C.S.

51/4" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set. IOD-1300A A & T with CP/M 2.2 ..... \$399.95

# **DOUBLE D - Jade**

High reliability double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrunt driven hus

| IOD-1200B  | Bare board & hdwr man    | \$59.95      |
|------------|--------------------------|--------------|
| IOD-1200K  | Kit w/hdwr & sftwr man   | \$299.95     |
| IOD-1200A  | A & T w/hdwr & sftwr ma  | n \$325.95   |
| SFC-590020 | 01F CP/M 2.2 with Double | le D \$99.95 |

# New CP/M Plus Version 3.0

# Shopping for S-100 Boards? **WE CAN BEAT ANY PRICE!!**

THREE BOARD SET - SD Systems

FREE CP/M 3.0 Save \$800.00

S-100 board set with 4 MHz Z-80A, 64K of RAM expandable to 256K, serial and parallel I/O ports, double-density disk controller for 51/4" and 8" disk drives, new and improved CP/M 3.0 manual set, system monitor, control and diagnostic software. Includes SD Systems SBC-200, 64K ExpandoRAM III, Versalioppy II, and FREE CP/M 3.0 - all boards are assembled & tested.

64K Board Set with FREE CP/M 3.0 ...... \$1195.00 256K Board Set with FREE CP/M 3.0 ...... \$1395.00 THREE BOARD SET - CCS

FREE CP/M 2.2

Save \$700.00

**Limited Quantity** 

S-100 board set featuring high speed DMA CPU and disk controller, includes 4 MHz DMA Z-80A CPU, 64K of high speed RAM, 2 serial and 1 parallel I/O ports, double-density DMA disk controller for 51/4" or 8" drives, FREE CP/M 2.2 on 8" disk with full manual set, all necessary diagnostic and control software. Package consists of the new CCS 282C DMA CPU, new CCS DMA disk controller (not the old 2422). & CCS 2065 64K RAM, and FREE CP/M 2.2 - all boards are assembled & tested with full factory warranty

SPECIAL PACKAGE PRICE Save over \$700.00 .. \$694.95

# Call Jade Toll Free for Prices

SD Systems, CCS, CompuPro, SSM Microcomputer, Memory Merchant Scion, Jade Computer, Dual Systems, Advanced Digital, Vector Graphics

# S-100 I/O Boards

# I/O-4 - SSM Microcomputer

| 2 001141110 | porte proc 2 paramer no porte. |
|-------------|--------------------------------|
| IOI-1010B   | Bare board w/manual \$35.00    |
| IOI-1010K   | Kit with manual \$179.95       |
| IOI-1010A   | A & T with manual \$249.95     |

# I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud IOI-1015A A & T .......\$289.95

# INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel. IOI-1840A A & T ......\$314.95 IOI-1840C CSC ......\$414.95

# THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

Not anymore; Jade is proud to offer our cost-effective solution to the problems mentioned above: THE BUS

Whether you're a hobbyist with a cantankerous kluge or a field technician with an anxious computer owner breathing down your neck, you'll find THE BUS PROBE speeds your repair time remarkably. Just plug in THE BUS PROBE and you'll be able to see all the IEEE S-100 signals in action. THE BUS PROBE allows you to see inputs, outputs, memory reads and writes, instruction fetches, DMA channels vectored interrupts, 8 or 16 bit wide data transfers, plus the three bus supply voltages.

| TSX-200B | Bare board \$59.95 |
|----------|--------------------|
|          | Kit \$129.95       |
| TSX-200A | A&T\$159.95        |

Circle 218 on inquiry card.

# S-100 CPU Boards

# SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included. CPC-30200A A & T ..... \$329.95

# THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600.

| CPU-30201B | Bare board w/manual \$35.00 |
|------------|-----------------------------|
| CPU-30201K | Kit with manual \$149.95    |
| CPU-30210A | A & T with manual \$199.95  |
|            |                             |

# 2810 Z-80 CPU - C.C.S.

2 or 4 MHZZ-80 CPU withseriall/Oport& on-board monitor PROM, front panel compatible CPU-30400A A & T with PROM ..... \$289.95

# CPU-Z - CompuPro

2/4 MHz Z80A CPU, 24 bit addressing. CPU-30500A 2/4 MHz A & T ...... \$279.95 CPU-30500C 3/6 MHz CSC ......\$374.95

# 8085/8088 - CompuPro

Both 8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory.

# CPU-20510A 6 MHz A & T ......\$398.95 CPU-20510C 6/8 MHz CSC .....\$497.95

# S-100 Video Boards

# **MICROANGELO - Scion**

Ultra-high-resolution 512 x 480, 256 color or black & whiteS-IOV-1500A A & T ...

Computer Products



\* MADE IN U.S.A. BY AMERICANS \*

# S-100-4 MINI'S

Choose the System that fits your needs! A complete computer system ready to add on a terminal and printer. All Systems include CP/M® software and system manual set. Full six-month parts and labor warranty excluding drives which carry the full O.E.M. manufacturers warranty. All S-100-4 Systems advertised are in stock assembled and tested available for immediate delivery.

# **DUAL DRIVE SUBSYSTEMS**





### **HORIZONTAL** OR VERTICAL

Fully Assembled and Tested Units w/two Shugart 801R SS/DD . . . . . \$ 975.00 w/two Shugart 851R DS/DD . . . . . . 1225.00 w/two Qume DT-8 DS/DD........... 1250.00 w/two Tandon 848-1 SS/DD......... 995.00 w/two Tandon 848-2 DS/DD ..... 1195.00

Computer **Systems** SPECIAL!

California



CCS SYSTEM 2410 . . \$1995.00

- Includes CP/M® 2.2 2-Serial/1-Parallel Port
- DMA Disk Controller Hardware Vectored Interrupts
- 2-Real Time Clocks Supports CP/M®,MP/M®,OASIS

# CCS 2300 System, A&T.. 1695.00

| •     | 2810 CPU  |                        |
|-------|-----------|------------------------|
| ullet | 2422 Disk | Controller Only-330.00 |
| •     | 2066 64K  |                        |

- 2300A Mainframe **NEW!!** Only—**455.00**
- CCS Apple Boards... Call Toll Free For Prices

# MINI FLOPPY

# П

# Only \$1395.00

COMPLETE

- ★ with 48 TPI single sided double density 54" . \$1395.00
- ★ with 48 TPI double sided double density 5¼" ..\$1495.00
- ★ with 96 TPI double sided double density 5¼" \$1650.00

An inexpensive but powerful system featuring a 4 slot S-100 bus chassis with the XOR S-100 board set; 4-MHZ Z-80 CPU ★ 64K dynamic memory ★ multi-sector mixed density disk controller ★ 2-RS232 output ports in the rear for your terminal and printer ★ 3 eight-bit parallel ports on the CPU ready to add a cable and interface to your printer \* All above systems are in stock ★ Includes CP/M® 2.2.

CP/M is a trademark of Digital Research

# **HARD DISK**

Cabinet A & T w/Power Supply and Accs. 235.00



# Only \$2995.00

COMPLETE

These S-100-4 Systems may be very small in size (9"H x 9½"W x 18½"L) but look at the size of the ATASI® 5¼" Winchester hard disks we offer!

# 4 models to choose from

| ★ Seagate 5 Megabyte System   | \$2995.00 |
|-------------------------------|-----------|
| ★ #3020 15.6 Megabyte* System | \$3495.00 |
| ★ #3033 26 Megabyte* System   | \$3995.00 |
| ★ #3046 36 Megabyte* System   | \$4495.00 |

The above systems include a 96 TPI double sided double density 5 1/4" floppy as standard. The hard disk is controlled via Western Digital's controller for hard disks. Other features are the same as system at left. Megabyte sizes mentioned above are the available storage space after

# TAPE BACKUP

WITH HARD DISK

Only \$4250.00 COMPLETE



Now available through U.\$ Micro Sales, the XOR IRWIN 510 S-100-4 tape backup system with 10 megabytes of hard disk storage. Back up your hard disk

on a mini-tape (we're talking 10 meg.) in less than 3½ minutes! The above system includes a 96 TPI DS/DD floppy drive and this system's modular design allows you to add a second floppy for only \$395.00.

# COMPAT

# WORD PROCESSING & TEXT EDITING

| WordStar                         | \$275.00 |
|----------------------------------|----------|
| MailMerge                        | 100.00   |
| SpellStar                        | 175.00   |
| Random House Thesaurus           | 135.00   |
| TEX (Text Formatter)             | 90.00    |
| Mince (Text Editor)              | 145.00   |
| Scribble (Formatter)             | 145.00   |
| (Both Mince & Scribble)          | 245.00   |
| Random House Thesaurus           | 135.00   |
| Final Word (Word Processor)      | 265.00   |
| Peach Pack (4 Programs)          | 450.00   |
| Spell Guard                      | 225.00   |
| WordMaster (Text Editor)         | 115.00   |
| The Word Plus (Spelling Checker) | 130.00   |

# **DATA APPLICATIONS**

| dBASE II                             | \$595.00 |
|--------------------------------------|----------|
| Quickcode (Program Generator, Screen |          |
| Builder for dBASE II                 | 250.00   |
| FMS-80                               | 890.00   |
| FMS-80-11                            | 440.00   |
| DataStar (Data Entry & Ret.)         | 245.00   |
| CalcStar (Elec. Spreadsheet)         | 145.00   |
| BT-80 (Rec. Retreival)               | 175.00   |
| Access Manager (For B-Tree)          | 250.00   |
| SuperCalc                            | 265.00   |
| Mailman (M/L Manager)                | 119.00   |
| NAD (M/L Manager)                    | 90.00    |
| Recover (Lost Data Recovery)         | 65.00    |
|                                      |          |

# LANGUAGES

| MBasic-80               | \$290.00 |
|-------------------------|----------|
| MBasic Compiler         | 325.00   |
| CBasic 2                | 100.00   |
| CB-80 (Compiler)        | 455.00   |
| Fortran-80              | 375.00   |
| PL/I-80 (Language)      | 450.00   |
| Pascal MT+ (Language)   | 445.00   |
| Pascal MT+ (Compiler)   | 310.00   |
| Cobol-80 (Language)     | 585.00   |
| C Compiler (Language)   | 215.00   |
| ADA (Compiler)          | 265.00   |
| MAC (Macro Assem.)      | 85.00    |
| Macro-80 (Macro Assem.) | 150.00   |

# Formats for XOR, NORTHSTAR, ALTOS, VECTOR GRAPHICS, Etc.

# COMMUNICATIONS

| Move-it                                    | \$ 80.00 |
|--------------------------------------------|----------|
| Crosstalk                                  | 160.00   |
| BSTAM                                      | 149.00   |
| BSTMS                                      | 149.00   |
| Term II                                    | 150.00   |
| CP/M® HELPS                                |          |
| ATI-CP/M <sup>®</sup> Power 2.2 (Training) | 75.00    |
| Supervyz                                   | 95.00    |
| CP+ (English Language Menus)               | 125.00   |
| Smart Key                                  | 50.00    |
| Smart Print.                               | 30.00    |
| ISIS (CP/M®) (Translator)                  | 199.00   |
| Dick-Edit                                  | 90 00    |

# **ACCOUNTING**

| Peachtree - Series 4      |          |
|---------------------------|----------|
| General Ledger            | \$395.00 |
| Accounts Receivable       | 395.00   |
| Accounts Payable          | 395.00   |
| Inventory                 | 395.00   |
| Payroll                   | 395.00   |
| Peach Pak (G/L, A/R, A/P) | 900.00   |
| Accounting Plus           | CALL     |
| Structured Systems        | CALL     |
| Medical                   | 845.00   |
| Dental                    | 845.00   |
| Master Tax (Prof 1040)    | 1500.00  |
| Standard Tax (A 1040)     | 550.00   |
|                           |          |

# OTHER APPLICATIONS

| SuperSort                          | \$190.00 |
|------------------------------------|----------|
| M-Sort                             | 170.00   |
| Q-Sort                             | 89.00    |
| Disk Doctor                        | 89.00    |
| Pearl 1 (Entry Lev. Prg. Gen.)     | 45.00    |
| Pearl 2 (Int. Prog. Gen)           | 250.00   |
| Pearl 3 (Advanced)                 | 450.00   |
| ATI D.B. Power (dBase II Training) | 75.00    |
| ATI SuperCalc (Training)           | 75.00    |
| ATI MBasic (Training)              | 75.00    |
| ATI WordStar (Training)            | 75.00    |
| DeSpool (Background Print Utility) | 45.00    |
| ZSID (Debugger)                    | 89.00    |



TWO Locations to Serve You

🖎 🕁 EAST Coast Call (815) 485-4002 ☆ WEST Coast Call (714) 891-2677

OUT OF STATE

ORDER TOLL FREE! 1 - 800 - 435-9357

TERMS: We accept VISA/MC, prepay, check or money order, Please allow personal check two weeks to clear before shipment. \$5,00 handling charge on all orders under \$5,000, 15% Restocking Fee. All orders shipped via U.P.S. unless otherwise specified. All UPS C.O.D. orders over \$1,00.00 require a lashers Check of Our products carry a full 6 months parts and labor warranty excluding drives, printers and terminals which carry the full O.E.M. factory warranty. PRICES SUBJECT TO CHANGE WITHOUT NOTICE.



MADE IN U.S.A. BY AMERICANS \*

★ EAST ★ 11 Edison Drive, New Lenox, Illinois 60451 ★ WEST ★ 6182 Garden Grove Blvd., Westminster, CA 92683

# **UNIVERSAL POWER SUPPLY**



For Big Board, Apple or Aim 65 +5VDC @ 3 Amps +12VDC @ .750 Amps

-12VDC @ .750Amps -5VDC @ .500 Amps

Dimensions: 4" x 4" x 1 1'

\$69.95

# **DISK DRIVE POWER SUPPLY**

For 2 - 8" or 5". Drives + 5VDC @ 4 Amps +24VDC @ 3 Amps 5VDC @ 1 Amp

AC Cables for 2 Drives \$7.50

Dimensions: 4" x 4" x 11"



\$59.95

# S-100 POWER SUPPLY



+8VDC @ 30 Amps +16VDC @ 6 Amps

-16VDC @ 6 Amps PC Board Design

Dimensions: 5" x 6" x 11" \$89.50

# **TERMINALS**

Televideo 910+ with green screen. \$575 T.V. 925 . . . . \$739 T.V. 950 . . . . \$945 Adds Viewpoint Model 3A+..... \$519 Zenith Z-19.....\$740

# **PRINTERS**

| Epson MX-80FT                 | \$549.00 |
|-------------------------------|----------|
| Epson MX-100FT                | \$699.00 |
| Okidata 82A 80 column         | \$465.00 |
| Okidata 83A 132 column        | \$745.00 |
| C-ITOH Prowriter I            | \$525.00 |
| I.D.S. Microprism Model 480 . | \$565.00 |

# 8" DISK DRIVES

SA801R ......388.00 ea. Two for 379.00 ea. SA851R ......**535.00 ea.** Two for **529.00 ea.** QUME DT-8 . 540.00 ea. Two for 529.00 ea. Tandon 848-1 395.00 ea. Two for 388.00 ea. Tandon 848-2 **525.00 ea.** Two for **519.00 ea.** Mitsubishi Model 2896 DS/DD ..... 475.00 ea.

# S-100 MOD by XOR

For test or systems applications. Complete S-100 12 Slot Mainframe with Disk Drive Power Supply for 4 Drives.

# **SPECIFICATIONS**

| Unroquiated | Regulated |
|-------------|-----------|
| Unregulated | +5V @ 5A  |
| +8V @ 30A   | +24V @ 3A |
| ±16V @ 6A   | -5V @ 1A  |

\$225.00 Kit with 12 S-100 Bus Connectors \$255.00 Assem. and Tested with 12 Bus Connectors \$15.00 AC/DC Drive Cable Set for 2 Drives Dimensions 6" x 10" x 18" - Shipping Weight 25 lbs.



Low Velocity Whisper® Fans Only \$18.00 ea. Finger Guards \$2.50 each.



S-100 MOD

# SERVICE 898-5525



# \$1695.00

- ★ 4 Stot S-100 Bus
- \* XOR S-100 Board Set
- ★ Two Separate Power Supplys
- ★ Inculdes CP/M\* 2.2 and Manl ★ All Cables Provided ★ Dimensions only 9" x 9" x 181/2"

# S-100-4 System Complete with:

- 2-Tandon Thinline 8" (Model TM-848-1 SS/DD)
- 2-Tandon Thinline 8" (Model TM-848-2 DS/DD) Part#S-1000-39..... \$1950.00

Now we are able to offer Mitsubishi thinline drives DSDD model 2896 for full 2.4 megabytes of formatted storage. All S-100-4 systems with these drives will include a full 6 months parts and labor warranty including the drives! Part #S-1000-34



# \$1795.00

# TERMINAL

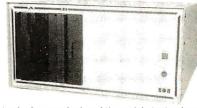
- ★ Feather Touch Capacitance Kybrd. ★ 60 Key Standard ASCII
- ★SOROC Type Screen Attribute Set
- ★ 8 Special Function Keys
- ★ Hatf Intensity
- ± 20 Screen Editing Keys
- COMPUTER \* XOR S-100 Board Set
  - ★ Includes CP/M® 2.2
- \* Programmable Keyboard Set
- ★ 8 Slot S-100 Bus

# S-100-8 System Complete With: Shugart 801R Subsystem\* (#S-1000-22) ...\$2675.00 Shugart 851R Subsystem\* (#S-1000-23) ... 2925.00

Qume DT-8 Subsystem\* (#S-1000-24) ..... 2950.00 Shugart SA 400 Minis (#S-1000-25)... 2350.00 Complete System, No Drives (#S-1000-21)... 1795.00

\*Available in Horizontal or Vertical Cabinet

# IN YOUR S-100-12



Introducing a major breakthrough in technology... The removable cartridge disk called the Alpha-10". 10 megabytes of removable storage space (14 meg unformatted) with the speed and reliability a Winchester offers. The complete system includes the XORZ-80 based 64K board set, the S1-MOD power supply/mother board, the Alpha-10" drive (w/ 3 cartridges), sitting alongside a Shugart 851 DS/DD multi-sector floppy disk, CP/M® 2.2 software and manuals, and we'll even throw in a 6 month parts and labor exclusive warranty.

\$3995.00 (#S1000-75)

If you already own an S-100-12 w/2 floppies buy an Alpha-10" upgrade package. Includes Alpha-10" cartridge drive, cartridge control board, S-100 interface board w/all necessary cables, software and manuals. System price includes 3 10 meg \$1995.00 cartridges. (#S-1000-80)

\*Extra cartridges available(#M-2000-51). \$50.00 ALPHA-10" is a product manufactured by IOMEGA" CORP.

# Apple 8" Disk Controller Card . . . . . \$395.00 ZVX4 Dual Density, Single & Double Sided - Auto Boot Disk 2 + 2 Single Density Single or Dual Sided **SVA**

Complete line of add on drives for Apple CALL TOLL FREE FOR PRICES

Ask about our Low Cost MODEM Software Hayes - MicroModem 100 Ser/Por 110/300 Baud \$275.00 Hayes - Smart Modem 300 Baud Orig/Ans Director \$250.00 NOV. - DCAT 300 Baud Direct Con. Ans/Orig 165.00 NOV. - AUTOCAT Auto/Ans/Orig Direct Con. 235.00 NOV. -APPLECAT 300/1200 Baud Direct Con. 350.00 PMMI - MM103 300/600 Baud (S-100). 359.00

# SEE US AT THE WEST COAST **COMPUTER FAIRE!**

Civic Auditorium Brooks Hall, San Francisco March 18, 19, 20, 1983 - Booths # 1844 and # 1846 Don't miss out . . . Be sure to call, write or visit us to get a 1983 Winter/Spring Catalog

# CALIFORNIA DIGITAL

Post Office Box 3097 B • Torrance, California 90503



Plastic library case supplied with all diskettes purchased from California Digital

\$2495

Private labeted for California Digital by one of the most respected producers of magnetic media. Each disknite is certified double density at 40 tracks. To insure extended media life all diskettle are manufactured with a reinforced hub.

Each box of diskettes is supplied with a free plastic library case. Soft sector CAL-501. Ten sector CAL-510

Ten boxes \$22.75 One hundred boxes \$21.50



Scotch

51/4" DISKETTES WITH LIBRARY CASE

\$**26.**<sup>50</sup>

Your Choice SCOTCH MEMOREX VERBATIM

Single Side Double Density

Soft Sector 10 Sector 16 Sector

| SCOTCH   | 744D-0 | 744D-10 | 744D-16 | 26.50 |
|----------|--------|---------|---------|-------|
| MEMOREX  | 3481   | 3483    | 3485    | 26.50 |
| VERBATIM | 525-01 | 525-10  | NA      | 26.50 |
| MAXELL   | MD1    | MH1-10  | MH1-16  | 29.85 |
| DYSAN    | 104/1D | 107/1D  | NA      | 45.00 |

# Double Side Double Density

| SCOTCH   | 745-0  | 745-10  | 745-16  | 42.50 |
|----------|--------|---------|---------|-------|
| VERBATIM | 550-01 | 550-10  | NA      | 42.50 |
| MAXELL   | MD2-D  | MH2-10D | MH2-16D | 45.00 |
| DYSAN    | 104/2D | 107/2D  | NA      | 49.50 |
| DYSAN 96 | 204/2D | NA      | NA      | 59.50 |

# EIGHT INCH DISKETTES

| Single S                                                                      | ide Single De         | nsity          | Single Si | de Double Den | sity  |
|-------------------------------------------------------------------------------|-----------------------|----------------|-----------|---------------|-------|
| SCOTCH                                                                        | 740-0                 | 29.50          | SCOTCH    | 741-0         | 39.00 |
| MEMOREX                                                                       | 3060                  | 29.50          | MEMOREX   | 3090          | 35.00 |
| DYSAN                                                                         | 3740/1                | 39.50          | DYSAN     | 3740/D        | 57.50 |
| Thirt                                                                         | y Two Secto           | r              | Double si | de Double Den | sity  |
| SCOTCH                                                                        | 740-32                | 29.50          | SCOTCH    | 743-0         | 47.50 |
| Scotch Head Cleaning Kits 5 % & 8" 124.95 Plastic Library Cases 5 % & 8" 2.95 |                       | 124.95<br>2.95 | MEMOREX   | 3114          | 39.50 |
| Diskette Flip Tub                                                             | s titty diskettes 5%* |                | DYSAN     | 3740/2D       | 65.00 |

ASCII KEYBOARD \$79



Each keyboard contains 81 high reliability Hall Effect keys. Outputs seven bit parallel ASCII MIC-81SD5 3 Lbs.



This Hitek keyboard is the same unit used by Lear Siegler in their middle line CRT terminals. The keyboard leatures 59 unencoded metal on metal contacts (HIK-59), Matching numeric cluster with 15 keys is available for \$9.95 (HIK-15), Buy both of these units for only \$29.90 and save \$5.00 (HIK-5815).

# MEMORY

1.95 4116 150ns.

2732 EPROM 4.95 450ns.

64K DYNAMIC 6, 95 4164 150ns. 16K STATIC 4.95 6116 200ns.



# 2764 EPROM SALE \$9.95

### DYNAMIC MEMORY

|                                 |                | 1-31  | 32+       | 100+    |
|---------------------------------|----------------|-------|-----------|---------|
| 4027 4K dynamic 250ns           | ICM-4027250    | 1 99  | 1.85      | 1 75    |
| 4116150ns. 16K                  | ICM-4116150    | 1 95  | 1.85      | 1 75    |
| 4116 200ns.16K                  | ICM-4116200    | 1 75  | 165       | 1 50    |
| 4164 150ns 64K 128 retresh      | ICM-4164150    | 6 95  | 6 50      | 5.90    |
| 41256150ns 256K                 | ICM-41256150   | Av    | ailabte M | arch 83 |
| S <sup>-</sup>                  | TATIC MEMORY   | ,     |           |         |
| 21L02 200ns 1K static           | ICM21L02200    | 149   | 1 29      | 1 15    |
| 21L02 450ns 1K static           | ICM-21L02450   | 1 29  | 1.15      | 99      |
| 2112 450ns 2K static            | ICM-2112450    | 2 99  | 2 85      | 2 75    |
| 2114 300ns 1K x 4               | ICM-2114300    | 1 95  | 1.85      | 1 75    |
| 40.44TMS 450ns 4K x 1           | ICM-4044450    | 3.49  | 3 25      | 299     |
| 5257 300ns. 4K x 1              | ICM-5257300    | 2 50  | 2.25      | 1 99    |
| 6116 P4200ns 2K x 8             | ICM-6116200    | 4 95  | 4 80      | 4 65    |
| 6116 P3150ns 2K x 8             | ICM-6116150    | 5 95  | 5 75      | 5 60    |
| 6167/2167 100ns. 16K x t (20 pi | n) iCM-6167100 | в 95  | 8 50      | 7 90    |
|                                 | EPROMS         |       |           |         |
| 2708 450ns. 1K x 8              | ICE-2708       | .1 95 | 4 75      | 4.55    |
| 2716 450ns 2K x 8               | ICE-2716       | 4 95  | 4 75      | 4.55    |
| 2716TMS 450ns Tri-voltage       | ICE-2716TMS    | 7.95  | 7 65      | 7 25    |
| 2732 450ns 4K x 8               | CE-2732        | 4.95  | -175      | 4 55    |
| 2732350ns 4K x 8                | ICE-2732350    | 6 50  | 8 00      | 7.60    |
|                                 | 105 0500       | 1000  | 0.00      | 0.00    |

271283506s 16K x 8 ICE-27128 Available March 83

CONNECTORS



DB25P

GOLD EDGE CONNECTORS

| Imsai   | solder .250" row   | \$2.95 | \$2.50 |  |
|---------|--------------------|--------|--------|--|
| Imsai   | wire wrap (TI)     | 3.95   | 3 50   |  |
| Sullins | Hi-Rel. , 250"     | 1.50   | 4.00   |  |
| Sulling | s Hi-Rel. W/W      | 5.35   | 4.00   |  |
| Sullins | /Altair . 140      | 1.95   | 4.50   |  |
| .156"   | Centers (standard) |        |        |  |
| 22/44   | Kim Evelet         | 2.50   | 2.15   |  |
| 36/72   | Digital Group S/F  | 5.95   | 5.50   |  |
| 36/72   | Digital Group W/W  | 6.60   | 6.13   |  |
| 43/86   | Motorola 6800 S/F  | 6.60   | 6.15   |  |
| 43/86   | Moto, 6800 W/W     | 7.00   | 6.85   |  |

| DITEGR. | AT ED | CIRCU  | IT Sec | KETS |
|---------|-------|--------|--------|------|
|         | Low F | rofile | Wire   | Wrop |
|         | each  | 1('0+  | each   | 100+ |
| 3 pin   | \$.10 | 8.09   | 8.46   | 8.41 |
| 14 pin  | .10   | .09    | .19    | .41  |
| 16 pin  | .12   | .11    | .50    | .45  |
| 18 pin  | .15   | .13    | .68    | .61  |
| 24 pin  | .26   | .24    | .94    | .87  |
|         |       |        |        |      |

| "D" Type      | each | 10-24 | 25-    |
|---------------|------|-------|--------|
| DEBP male     |      |       | \$1.30 |
| DE98 female   | 2.25 | 2.00  | 1.:10  |
| DE hood       | 1.50 | 1.35  | 1.:20  |
| DA15P male    | 2.35 | 2.15  | 2.00   |
| DA15S female  | 3.25 | 3,10  | 2,90   |
| DA hood 2/P   | 1.60 | 1.35  | 1.30   |
| DB 25P male   | 2.50 | 2.35  | 2.25   |
| DB 23S female | 3.35 | 3.15  | 3.05   |
| DB hood 2/P   | 1.35 | 1.15  | 1.05   |
| DC37P male    | 4.20 | 4.00  | 3.70   |
| DC37S female  | 6.00 | 5.73  | 5.50   |
| DC hood 2/F   | 2.25 | 2.00  | 1.75   |
| DD50P male    | 5.50 | 5.10  | 4.75   |
|               | 9.40 | 8.30  | 8.00   |
| DD50 hood 2/P | 2.60 | 2.40  | 2.10   |
|               |      |       |        |

CENTRONICS 57-30360 7.95 6.75 3.75 RIBBON CARLE CONKECTORS 17/34 57 etsk 4.85 4.15 3.95 20/40 PRS-400 5.63 5.05 4.70

23"
COMPOSITE
MONITOR
\$159

Ideal monitor for classroom demonstrations.



Ever try galhering a classroom of students around a 12 monitor? Here is your opportunity i purchase a 23 high resolution monitor at a reasonable price.

These units accept standard compost video signals generated by most personal computers includir the Apple and IBM. Attach it your computer and in second you are shooting down Klingons in wide screen video.

screen video.

MOT-BW23 35 Lbs. Monitors are open frame and for safety should be enclosed. Wood graine enclosure for above \$35.00 additional CAL-ENC23.15 Lbs.



### Eight Inch Single Sided

|                       | One    | Two | Ten |
|-----------------------|--------|-----|-----|
| SHUGART SA801R        | \$395  | 385 | 375 |
| SIEMENS FDD100-8      | 259    | 259 | 225 |
| TANDON 848-1 SLIMLINE | 379    | 369 | 359 |
| Eight Inch Doubl      | e Side | d   |     |
| SHUGART SA851R        | 525    | 495 | 475 |
| QUME DATA TRACK 8     | 525    | 495 | 475 |
| MITSUBISHI M2894-63   | 485    | 475 | 469 |
| OLIVETTI 802/851      | 369    | 359 | 349 |
| TANDON 848-2 SLIMLINE | 495    | 485 | 475 |
| SHUGART 860 THINLINE  | 569    | 549 | 539 |
| Five Inch Single      | Sidad  |     |     |

### Five Inch Single Sided

SHUGART SA400

OLIVETTI 502 2/3 height

| Ollowilli Ollifot    |       |     |     |
|----------------------|-------|-----|-----|
| TANDON TM 100-1      | 209   | 199 | 195 |
| Five Inch Double     | Sided |     |     |
| SHUGART SA450        | 349   | 329 | 315 |
| TANDON TM 100-2      | 295   | 269 | 259 |
| TANDON 96TPI TM100-4 | 369   | 355 | 350 |

215 .209 199

215

239

# Three Inch Rigid Floppy

| HITACHI-AMDEK | call for pricing |
|---------------|------------------|

# Five Inch Winchesters

| SEAGATE 506 6 Megabyte   | 759 | 725 | 695 |
|--------------------------|-----|-----|-----|
| SEAGATE 512 12 Megabyte  | 995 | 960 | 960 |
| TANDON 603SE 14 Megabyte | 995 | 960 | 895 |
| WESTERN DYNAX removable  | 995 | 960 | 950 |

Upon request, all drives are supplied with power connectors and manual



Two Siemens FDD100-8 disk drives with power supply, 4" exhaust fan complete with all necessary power cables.

Same as above but with:

Shugart 801R MSD2801 \*1195 | Olivetti 802 CAL2802 \*1250

Shugart 851R MSD2851 1450 Qume DT8 MSD8DT 1450

### 100 September 100 Septembe

# INDUSTRIAL S-100 MAINFRAME

Suitable for hospital and industrial applications. Constructed from 304 brushed stainless siteel. Modualar 500 watt toroid power supply provides 8 worlts at 30 Amps and \_16 Voits at 4 Amps. Supplied with standard 18 slot Faraday mother board. Auxiliary switched AC receptacles. The Eclipse 100 can be either table or rack mounted. Provisions for internally mounting a ten megabyte Winchester disk drive.

The Eclipse 100 is the perfect mainframe to fill the void left by the now defunct TEI Corporation. EPS-100 50 lbs.



TOLL FREE ORDER LINE (800) 421-504: TECHNICAL & CALIFORNIA (213) 679-900:

Shipping: First five pounds \$3.00. Each additional \$.50. Foreign orders: 10% shipping. Excess will be refunded. California residents add 6½% sales tax. COD's discouraged. Open accounts extended to state supported educational institutions and companies with a "strong" Dun & Bradstreet. Warehouse: 15608 Inglewood Blvd. Visitors by appointment.

# LICORNIA

Torrance, California Post Office Box 3097 B

uper Buy \$239



FDD 100-8 8" DISK DRIVE

10 Drives \$209 • 100 Drives \$175

California Digital has recently participated in the purchase of several thousand Siemens FDD 100-8 floppy disk drives. These units are electronically and physically similar to that of the Shugart 801 R. Any application that will accept the Shugart will work with the Siemens FDD 100-8. All units are new and shipped in factory sealed boxes. Because of the extremely low price we expect a quick sell out. SEA-F1008 17 lbs. Manual and power connectors supplied free upon request. Also available: Two drive subsystem supplied in metal enclosure with power supply and exhaust fan. \$750.00 CAL-2F1008.

# MORROW DESIGNS MICRO DECISION

Buy before month end and California Digital will supply, free of any additional cost, 50 Diskettes and a 5¼" Flip & File.

Includes \$1800 worth of free software:

Digital Research 2.2 CP/M

- MicroPro Wordstar
- Electronic Spreadsheet
- NorthStar Bazic Spelling Checker
  - Microsoft Basic 80

The Morrow Micro Decision offers one of the best values in small business computers. Standard features include 64K of RAM, 4MHz Z 80 CPU, two RS232 serial ports, dual density floppy disk controller capable of supporting four disk drives, and a 200 Kilobyte 5½" disk drive. The unit is powered by a low noise switching power supply.

The low profile enclosure should blend in to most any office environment. The Micro Decision is delivered complete with CP/M 2.2 as well as Basic 80 and Wordstar. Available options include a second disk drive and a video terminal. MDS-MD1 18 lbs.

ECLIPSE 80FT



### MATRIX PRINTERS

| StarGemini-10 friction & tractor 100 char/sec parallel | STR-Gt0    | 35900          |
|--------------------------------------------------------|------------|----------------|
| Star Eclipse 80FT friction & tractor                   | STR-EBOFT  | 29700          |
| Okidata 82A serial & parallel 912 paper                | OKF-82A    | 45900          |
| Okidata83A serial & parallel 15" paper                 | OKI-83A    | 69500          |
| Okidata 84A serial & parallel 15 paper                 | OK1-8-1A   | 107900         |
| Okidata 2350 (new) 350 char/sec                        | OKI-2350   | 199500         |
| EpsonMX80FT with graphtrax, friction& tractor feed     | EPS-MX80FT | 519 00         |
| EpsonMX100 with graphirax, 15" paper                   | EPS-MX100  | 695 00         |
| NEC8023A parallel 917 paper, graphics                  | NEC-8023A  | 485 00         |
| Anadex 9500A high speed 15 paper                       | ADX-9500A  | 127900         |
| Anadex 9501A high speed withgraphics                   | ADX-9501A  | 127900         |
| Dalasouth 180 high speed 180 cps 15                    | DSI- 180   | 129500         |
| Quantex 7030 corespondence quality 180 char/sec        | OTX-7030   | 153500         |
| Prowriter 8510 parallel 912 paper                      | PRO-8510P  | 49500          |
| Prownler 8510 senal 912 paper                          | PRO-8510S  | 63900          |
| Prowriter II 15' paper                                 | PRO-2P     | 75000          |
| Printronix P300hightspeed printer 300 lines per minute | PTX-P300   | <b>\$50000</b> |
| Printronix P600 ultra high speed 600 lines per minute  | PTX-P600   | 615000         |
| Mannesmann Tally 1805 200 char/sec serial              | MAN-1805   | 165000         |

| WORD PROCESSING PRINTERS                                                                 |                      |         |  |
|------------------------------------------------------------------------------------------|----------------------|---------|--|
| NEC7710 55char/second, serial interlace<br>NEC7730 same as above only parellel interface | NEC-7710<br>NEC-7730 | 23790   |  |
| NEC35t0 15 senal                                                                         | NEC-3510             | 177500  |  |
| Diablo63040 char/sec senal                                                               | DBL-630              | 22500   |  |
| Brother HR11 daiseywheel                                                                 | BTH-HR1\$            | 8550    |  |
| Brother HR11 serialinterface                                                             | BTH-HR1S             | 8950    |  |
| Smith Corona TP-1 daisy wheel printer. Serial                                            | SCM-TP1S             | 6590    |  |
| Starwriter F10 serial<br>Starwriter E10 parallel                                         | PRO-FIOS<br>PRO-FIOP | 1.17500 |  |

**EPSON MX80** RIBBONS §6.95

# MONITORS

| Zenith Z121 green phosphor 12" 40/80 column switch Z1H-Z121        | 115 00 |
|--------------------------------------------------------------------|--------|
| BMC 12A green phosphor 15 Mhz, composit video BMC-12/4             | 8800   |
| BMC 12EN green phosphor 20 Mhz. high resolution BMC-12EN           | 139.00 |
| NEC JB1201 green phosphar 18 Mhz composit video NEC-JB12(1)        | 16900  |
| NEC JB1260 green phosphor commercial grade composit NEC-1260       | 129 00 |
| Motorola 23" open frame blk/white composit video MOT-BW23          | 159 00 |
| Motorola 12" open frame blk/white regires horz sync & pow MOT-8W12 | 69 00  |
| Conrac 9" open frame requires horz sync & power supply CON-BY/9    | 5900   |
| (COLOR)                                                            |        |
| NEC JC1201'composit color NEC-JC1201                               | 32500  |
| NEC RGB monitor NEC-12020M                                         | 87500  |
| BMC 13"Composit video BMC-1400CL                                   | 27300  |
| BMC 13" RGB color monitor BMC-1401RGB                              | 32900  |
| BMC interface card for Apple II for above RGB BMC-81RGB            | 149.00 |
| Comrex/Hitachi 13" RGB high res. monitor COM-6600                  | 539.00 |
| Comrex/Hitachi 13" Composit color monitor COM-6500                 | 395 00 |
| Amdek color # 1 composit video AMO-100                             | 349 00 |
| Amdek color #2 high res. RGB color momter AMD-200                  | 739 00 |
| Amdek color #3 commercial grade color RGB AMD-300                  | 475 00 |
| 3000 COLOT 1100 TIME 300                                           | 473 00 |
|                                                                    |        |



# **Direct Connect** MODEMS

| 100 A R 0                                                                                                                                                                                                                                             |                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Hayes Micromodem 100 S-100 modem HYS-100 Hayes Smart Model RS232 HYS-232 Hayes Micromodem II Apple direct connect HYS-MM2 Hayes Chronograph time & date HYS-CHR232                                                                                    | 319 00<br>229.00<br>279.00<br>199.00        |
| Novation Cat acoustic connect NOV-CAT Novation D Cat direct connect va handset NOV-DCAT Novation 212 Autocat Bell 212A NOV-212 Novation Auto Cat 103 NOV-AUTO                                                                                         | 149 00<br>169 00<br>595 00<br>219 00        |
| Universal 103LP direct connect, line powered UOS-103LP<br>Universal 103LPJ direct connect, auto answer UOS-103LPJ<br>Universal 202 direct connect 1200 baud, half duptex UOS-202LP<br>Universal 212LP direct connect 1200 baud, full duptex UOS-212LP | 16 9 0 0<br>209 0 0<br>18 9 0 0<br>45 0 0 0 |
| Signalman Mark I direct connect with terminal cable SGL-MK1                                                                                                                                                                                           | 8900                                        |



| Ampex Diatogue 80 green screen, two page.     | function keys APX-D80C | 7   |
|-----------------------------------------------|------------------------|-----|
| Ampex Oralogue 80 amber screen, two page      | function keys APX-D80A | 7   |
| Ampex Dialoque 80 green screen Selectric I    |                        | 8   |
| Ampex Dialogue 81 amber screen. Selectric     |                        | 8   |
| Ampex Touch Term screen command for dal       | ta entry APX-T80       |     |
| Wyse horz & vert split screen, metal case, of | fetatch keybd WYS-100  | 8   |
| Televideo 910C emulator TVI-910C              |                        | 5   |
| Televideo 910 Plus block mode TVI-910P        |                        | 5   |
| Televideo 925C detatonable keyboard, 22 lur   | iclion keys TVI-925    | 7   |
| Televideo 950 graphic char . split screen 22  | functions TVI-950      | 9   |
| 18M 3101-10 detatchable keyboard, green IBI   | M-3101                 | 1.1 |
| Zenith Z-19 keyboard ZTH-Z19                  |                        | 7   |
| Adds Viewpoint A1 detatchable keyboard Al     | DD-VP1                 | 4   |
| Adds Viewpoint A2 xy cursor, gieen screen     |                        | 5   |
| Adds Viewpoint A3 emulator, ADD-VP3           | 11                     | 5   |



APL-48P APL-DSK1 APL-DSK2

MTN-TC MTN-ST MTN-RO



# APPLE BRAND PRODUCTS

Apple Plus 48K RAM Apple disk with controller card Apple disk without controller card

|                             | XITEN                                   |          |  |
|-----------------------------|-----------------------------------------|----------|--|
| XTN-G10                     | Xiten 10 Megabyte Gallium hard disk     | 1 995 00 |  |
| XTN-16K                     | 16K RAM card for Apple II               | 69 00    |  |
|                             | RANA SYSTEMS                            |          |  |
| RAN-APL1                    | Apple add on disk drive with controller | 52500    |  |
| RAN-APL2                    | Apple add on drive without controller   | 39500    |  |
| CALIFORNIA COMPUTER SYSTEMS |                                         |          |  |
| CCS-7710                    | Asynchronous Seval Interface            | 125.00   |  |
| CCS-7728                    | Centionics Parallel Interface           | 95 00    |  |
| CCS-7720                    | Apple Parallel Hitelface                | 95 00    |  |
| CCS-7114                    | 12/R RomiPiom Module                    | 115 00   |  |
| CCS-7424                    | Catendar/Ctock Module                   | 9500     |  |
| CCS-7440                    | Programmable Time                       | 9500     |  |
| CCS-78118                   | Artifizette Processor to Apple II plus  | 319 00   |  |

|          | MOUNTAIN COMPUTERS, INC.                                      |               |
|----------|---------------------------------------------------------------|---------------|
| S        | CPS Multifunction Card                                        | 169           |
| LK<br>LK | Clock/Calencial<br>Supertalker S0200                          | 1490          |
| MRTR     | Rom Plus with Keyboard litter<br>Rom Writer with Eprom socket | 1690<br>1450  |
| DA<br>R  | A-D/D-A Converter -X-10 Control Card for BSR system           | 2690<br>1.191 |
| n        | MICRO SOFT                                                    | 1.131         |
|          |                                                               |               |

| MOLOLICHO  | MICIOSOIL Z-80 GPU Cat()          | 24900  |
|------------|-----------------------------------|--------|
| MSF-16KRAM | Microsoft 16K RAM card            | 12500  |
|            | VISTA                             |        |
| VSA-A800   | Vista 8" controller card          | -18900 |
| VSA-VIS80  | Vista Vision 80                   | 28900  |
| MCI-CNTRL  | Micro Sci disk drive controller   | 8900   |
|            | FOURTH DIMENSION                  |        |
| FBN-SPRDRV | Super Drive-35 track Apple add on | 32900  |
|            | SORRENTO VALLEY ASSOC             |        |

# Single sided, single density controller Double sided, single density controller ADVANCED BUSINESS TECH

# S-100



STATIC MEMORY BOARDS

| 10         | BIT MICHUPHUCESSURS                      |          |
|------------|------------------------------------------|----------|
| GB1-8687   | Godbout 8086 / 8087 Micropiocessor bodis | 495 (10) |
| GB1-8687   | Godbout 8088/8085 dual 8 bit             |          |
|            | Blicioprocessor                          | 359(10   |
| SEA-8086   | SeattleComputer 16bit micro two          |          |
|            | boardset                                 | 66900    |
| TEC-8086   | Tecmar Computer 16 bit microprocessor    | 595 00   |
| LO1.1-8066 | Lomas Oata Systems Lighting One          | CVII     |
| SIN        | IGLE BOARD COMPUTERS                     | 6        |
| WAV-BET1   | Wavemate Bullet 1 with floppy 256K       | 79500    |

# Advanced Micro Digital Hoppy & 64K Telelek FDC1 Single board NEC765 AMD-Z80 TEL-FDC1

| 8 1                    | BIT MICROPROCESSORS                                                 |        |
|------------------------|---------------------------------------------------------------------|--------|
| GBT-280                | Godbou t Z 80 8 bit CPU 24 bit extended address                     | 250 00 |
| CCS-2810<br>SDS-SBC200 | California Computer Z - 80 microprocessor<br>SDSystems SBC 200 Z-80 | 275 00 |
| f-1SN-780              | microprocessor                                                      | 27500  |
|                        | Measurement System 2.80 2810<br>microprocessor                      | 425(X) |
| TAR-Z80                | Tarbell Électronics Z 80 viith two RS232 ports                      | 39500  |

FLOPPY DISK CONTROLLERS

# Controller Tarbeil Electronics supple density

| 1411000                          | controller                                                                                                     | 27900           |
|----------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------|
| C                                | PM OPERATING SYSTEM                                                                                            |                 |
|                                  | Godboul CPM 2 2 for DiSk Dne 8 bit<br>operation                                                                | 160 00          |
|                                  | Godboul CPM 86 for Disk One for use with 8088                                                                  | 26500           |
| GBT-CPM86                        | Godbout CPM 66 for operation with<br>8086 board                                                                | 265 00          |
| Н                                | ARD DISK CONTROLLER                                                                                            |                 |
| GBT-DSK2<br>GBT-DSK3<br>MDS-W506 | Godbout Disk II hard disk controller<br>Godbout Disk III hald disk controller<br>Morrow Designs Winchester for | 695 00          |
| WDI-1000                         | Seagate 506<br>Western Digital WD 1000 (not S 100)                                                             | 195 00<br>49500 |
|                                  | EPROM BOARDS                                                                                                   |                 |

# SPECIAL FUNCTION BOARDS 95 M 100 D.C. - Jayes Micromodem S. 101F CC. Jupinoveri 105 M 100 M. serman Digital Noisemaker with Visitas modale. Of Compiller Close Chendar In and Semin Ale magaster at option.

ons out i

|     | 27900  |       |
|-----|--------|-------|
| М   |        |       |
|     |        | HY    |
|     | 160 00 |       |
| 150 |        | Aft   |
|     | 26500  | UR    |
| h   | 001.00 | 50    |
|     | 265 00 | 53.0  |
| ER  |        | Fill: |
|     | 695 00 | 181   |
|     |        | - GH  |
|     |        | 6H    |
|     | 195 20 | -     |
|     | 49500  | 530   |
|     |        | 531   |
|     |        | AD    |
|     | 276/10 | 00.1  |

- 256 kilobytes of memoryusing 64K dynamic RAP
- Error detection-trap capability.

24 bit addressing and phantom mode capability.

A bit addressing also plantom mode capability.

The Caldroma Quality 266K RAM beant represents an outstanding value in S-solve earlier generation skif dynamic ram boards it gives you these additions a planty error feature can be jumped to any of the interrupt lines a status policy of the proper operation with hort panel equipped systems. DNA disk controllers, a sassured with an on the board MT generator for memory refresh timing. CAS a random to the board on over the entire ceptantic pemperature. The board is very recent in design using the National Semiconductor DP-830G inchesives a voltage regulators. CAS bein and RNS lines eliminating the is separate voltage regulators. One for the DPAMA and one for the interface logic of the rain array 1 years placed began to a which in the interface logic of the rain array 1 years placed began to a which is considered to the capability of the



Shipping: First five pounds \$3,00. Each additional \$,50. Foreign orders: 10% shipping. Excess will be refunded. California residents add 6½% sales tax. COD's discouraged. Open accounts extended to state supported educational institutions and companies with a "strong" Dun & Bradstreet. Warehouse: 15608 Inglewood Blvd. Visitors by appointment.

**TOLL FREE ORDER LINE** (800) 421-5041 **TECHNICAL & CALIFORNIA** (213)679-9001

| 7400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Number of Pins of each I.C. for easy Socket purchase                                                              | MICHOLING COMPONENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | valuation INTERSIL THE VALUE OF |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part No. **Pina Price  SNY400N 1419  SNY400N 1419  SNY400N 1419  SNY401N 1429  SNY402N 1429  SNY402N 1429  SNY401N 1439  SNY401N                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                   | Part   Part | Mo.   Pink   Fincision   Price                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| C04028 16 .59 CD4075 14 .29 CD4030 14 .39 CD4030 14 .39 CD4031 14 .39 CD4031 14 .29 CD4035 16 .89 CD4035 16 .89 CD4032 14 .29 CM608 16 CD4035 16 .89 CD4035 14 .29 CM608 14 .2 | MC14411 24 11.95<br>MC14412 16 13.95<br>MC14419 16 7.95<br>MC14433 24 13.95<br>MC14538 16 1.19<br>MC14541 14 1.19 | 1355 SHOREWAY ROAD, BELMONT, CA 94002 fro                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | T1057 — Expands the DT1050 vocabulary mr 137 to over 260 words. Incl. 2 ROMs and specs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 508 BYTE February 1983                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Circle 219 on inquiry card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



JSP (2) . . . \$4.95/pair



JSA (2) . . . \$6.95/pair

TV GAME SWITCH Switches TV to video game

or computer operation.

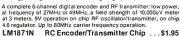
TGS-1 . . . \$2.95 ea.



|                  |          | JOYSTICKS                               |
|------------------|----------|-----------------------------------------|
| CONST.           | JS-5K    | 5K Linear<br>Taper Pots \$5.25          |
|                  | JS-100K  | 100K Linear<br>Taper Pots \$4.95        |
|                  | JS-150K  | Taper Pots                              |
| JS-5K (Pictured) | JVC-40   | 40K (2) Video Controller in Case \$4.95 |
| JS KNOB Knob fo  | or JS5K, | 100K,150K \$.99 ea.                     |
| JVC KNOB Knob fo | or JVC-4 | 0 \$.99 ea.                             |
|                  |          |                                         |

# RADIO CONTROL CIRCUITS

- ldeal to use for:
   Toys, hobby crafts, robots, trains
   Burglar alarms IR data link
- Burglar alarms \* IR data link
   Remote slide projector control
   Consumer remote data links
   Energy-saving, remotely switched lighting systems



A complete RF receiver/decoder, used at either 27MHz, 49MHz or 72MHz, it provides 4 independent channels when used with LM1871 (2 analog, 2 dig.) operates from four 1.5V cells, Crystal controlled.

(2analog, 2 dig.) operates from four 1.59 cens, crystal communes.

LM1872N RC Receiver/Decoder Chip . . . . \$2.49

SRX1504 49.435MHz Crystal (LM1872N) . . \$3.95 SRX1505 49.890MHz Crystal (LM1871N) . . . \$3.95

# Digital Thermometer Kit



Dual sensors - switch controls for indoor/outdoor controls for indoor/outdoor or dual monitoring — can be extended to 500 feet. Continuous LED 8\* ht. display. Range: 40°F to 199°F. 40°C to 100°C. Accuracy ±1° nominal. Calibrate for Fa hren het if Cel slus. Simulated walnut case. AC simulated walnut case. AC 6%°L × 3%°H × 1%°O.

| 30001 | National CMOS Data Book(1981)                                                                            |
|-------|----------------------------------------------------------------------------------------------------------|
| 80002 | National Interface Data Book (1980)                                                                      |
| 30003 | National Linear Data Book (1982)                                                                         |
| 30004 | National Series 80 — Board Level Computer (1980) \$4.95 (224 pages)                                      |
| 30005 | National TTL Logic Data Book (1981)                                                                      |
| 3000  | 06 Above (3) 30001,3,5 as set\$24.95                                                                     |
| 80008 | National Memory Data Book (1980)                                                                         |
| 30009 | Intersil Data Book (1983) \$9.95<br>(1356 pages) Complete line.                                          |
| 30010 | National Audio/Radio Handbook (1980)                                                                     |
| 30011 | National Linear Application Handbook (1980)\$15.95<br>(736 pages) Application Notes, Linear Briefs, etc. |
| 30012 | National PAL Data Book (1982)                                                                            |
| 30013 | Zilog Data Book (1983)                                                                                   |
|       |                                                                                                          |

BOOKS

NATIONAL SEMICONDUCTOR - INTERSIL - INTEL





Mostek DC/DC Converter +5 VOLTS TO -9 VOLTS

DC10 .....\$2.95 ea. or 2/\$4.95



# **Battery Checker**

Easy-to-use hand-held battery checker tests AA, AAA, C, D, and 216 batteries. A multi-colored meter shows if battery Is good, weak or needs replacing. Size: 6¼ "L x 2¼ "W

BC-1 . . . . . . . . . . . . . \$6.95 ea.

# <u> POWER SUPPLIES — KEYBOARDS</u>



POWER SUPPLY +5VDC @ 1 AMP REGULATED

Transact
Output +5VDC @ 1A (also +30VDC) reg. Input 115VAC 60Hz. 2-tone (black/beige) sel
case. 6 Ht., 3 cond. black power cord. 6% W x 7"D x 2% "H. Wt. 3 lbs. Data sheet in Part No. PS51194 ..\$19.95 each POWER SUPPLY +5VDC @ 1 AMP REGULATED

Output +5VDC @ 1 amp, +35-42VDC adj. 400mA or loss, 30VAC (Isol.) @ 1.5 amp. Input 115VAC 50Hz, Urc. brkr. re-set button, Bik, self-encl. case w/4 rubber feel. 5 Hr., 3 cond. bik, pow. cord. Or/off switch, 6-V, W x x 7 w. 03 x 3-78" H - W. 7, 1bs. Olds a sheel included. 

Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Delitron Del

Part No. UPS-1

SZ-9.5 Bactol

Toylor SupPLY + 5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 11SVAC, 50-60H; @ 3 amp/230VAC, 50H; @ 1.6 amp, 8 n. volt. /power supply select switkes (115/230VAC), Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp, 8 ft. blk, pow. cord. 11V1
13% 10 2 3% 'H. Wt. 6 lbs.

\$49.95 each

POWER SUPPLY 4-Channel Switching Power Supply Microprocessor, mini-computer, terminal, medical equipment and process control applications. Insu: 90-130VAG 47-44HK. Johght. - 5VDC @ 6.3-5VDC @ 14. -12VDC @ 14. -12VDC @ 14. -12VDC @ 14. -12VDC & 14. -12V

POWER SUPPLY Adjustable Switching 4-24VDC to 5 Amps Adj. 4-24VDC; \$VDC @ 5A, \$VDC @ 4.8A, \$VDC @ 4.1A, \$VDC @ 3.1A, \$VDC @ 3.1A, \$VDC @ 1.9A, 24VDC @ .5A, \$VDC & 1.9A; 24VDC @ .5A, \$VDC & 2.5VDC & 3.6VDC & 4.8A, \$VDC & 2.5VDC & 5.0VDC 
JE224A Assembled & Tested 

16%"L x 51/4"W x 1%" Word Processing Keyboard, 25 Pin Edge Card Connection, Supply Voltage + 5VDC, Main Keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.

Part No. 85SD18-1. PARTY CALL 23"Lx5¾"Wx1-3/8"H

MICRO SWITCH 88-KEY KEYBOARD (PARALLEL) 

14"L x 534"W x 1%6"

SPST switching, mechanical, monolithic housing, charcoal grey keycaps. Keyboard is not mounted on circuit board (each key is individually accessible). Used to replace touch-membrane found on Sinciar, Karri, and TRS-80 computers.

Part No K-SG. Part No. K-58 .....\$19.95 104-Key Keyboard



CA153A . . . . . . . . . \$69.95 95-Key Keyboard

CONTROL DATA Data Entry Keyboards RS232 Interface FT2 Shielded Base SPST Switching

CA148 .....\$99.95 80-Key Keyboard

30" Interface CA154A . . . . . . . . . \$79.95 CA150C . . .\$89.95 Color; keycaps: black, blue, red - cover: black w/beige base. 21 1/2 " x 9 " x 3 1/2 ". 6 lbs.

BUG BOXTM — 30 individual compartments

\* Stores 60 8 pin or 30 14 or 16 pin DIPs \* Heavy duty injection moided plastic \* Celear plastic cover
sides 8 locks \* Cover marked winumbers 1:30

\* Compartment size: " \* 2,375 \* x. 5" deep \* Box

size 4.9" x 3.3" x .5" \* Weight: 1.75 oz.

\*\*BUG BOXTM\*

Please specify color code: (B) Blue, (R) Red, (W)

white. (N) Yellow

BUG CAGETM — 12 locations store Bug Boxes, Big Bug Boxes or Bug Trays - Modular and interlocking - Heavy duty injection molded plastic • Each cage has 6 silp-on locations • 2 cages per Fig. • Cage size: 5-18" × 5" × 3-78" • 4 colors available — please specify color code: (8) Blue, (R) Red, (W) VMILC, (17) Vetflow Part No./Color Code BGC-001-( ) 2 Cages (6 loc. ea.) ..\$11.95/pkg.

| Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page | Page |

# BUG BOX™ STORAGE SYSTEMS



LSI BIG BUG BOXTM — Designed to store large IC's, Resistors, Capacitors and Diodes • Divided into three compartments measuring 1" x 4.15" x 5" deep \* Three vertical and three horizontal dividers included • Heavy duty injection molded plastic • Box size 4.9" x 3.3" x 6" • Weight: 1.75 oz.

LSI BIG BUG BOXTM 

BACK PACKTM — Self-adhesive labels for the back of ICs • Shows exact internal logic in relation to IC pins • S22 labels in each package (including several blank labels) • Each package for 8, 14, 16, 28 and 40 pin ICs • Combo package includes 1,068 labels for TTL and CMOS ICs • Microprocesor package contains 74 labels

Description
TTL ...... Part No. BPT-012

# JUMPER AND CABLE ASSEMBLIES STANDARD DIP JUMPERS

| JAMECO<br>Part No. | Cross Reference | No.<br>Pins | Description | Wire<br>Length | Price  |
|--------------------|-----------------|-------------|-------------|----------------|--------|
| DJ14-1             | 924102-12       | 14          | single end  | 12"            | \$1.79 |
| DJ14-2             | 924102-24       | 14          | single end  | 24"            | 2.05   |
| DJ14-3             | 924102-36       | 14          | single end  | 36"            | 2.35   |
| DJ14-1-14          | 924106-12       | 14          | double end  | 12"            | 2.95   |
| DJ14-2-14          | 924106-24       | 14          | double end  | 24"            | 3.19   |
| DJ14-3-14          | 924106-36       | 14          | double end  | 36"            | 3.49   |
| DJ16-1             | 924112-12       | 16          | single end  | 12"            | 1.89   |
| DJ16-2             | 924112-24       | 16          | single end  | 24"            | 2.19   |
| DJ16-3             | 924112-36       | 16          | single end  | 36"            | 2.59   |
| DJ16-1-16          | 924116-12       | 16          | double end  | 12"            | 2.95   |
| DJ16-2-16          | 924116-24       | 16          | double end  | 24"            | 3.29   |
| DJ16-3-16          | 924116-36       | 16          | double end  | 36"            | 3.59   |
| DJ24-1             | 924122-12       | 24          | single end  | 12"            | 2.69   |
| DJ24-2             | 924122-24       | 24          | single end  | 24"            | 3.19   |
| DJ24-3             | 924122-36       | 24          | single end  | 36"            | 3.59   |

| DAMPO | Comp. Nature | Comp. STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4-foot lengths. Call today STANDARD CABLES

| 427       |             |              |        |
|-----------|-------------|--------------|--------|
| PartNg.   | CableLength | Connectors   | Price  |
| D825P.4   | 4 feet      | 1-DB25P      | \$7.95 |
| DB25S-4   | 4 feet      | 1-DB25S      | 8.49   |
| D825P-4-P | 4 feet      | 2-DB25P      | 13.49  |
| DB25P-4-S | 4 leet 1-D  | B25P/1.D825S | 13.75  |
| DB25S-4-S | 4 feet      | 2-DB25S      | 13.95  |

\$10.00 Minimum Order — U.S. Funds Only California Residents Add 6½ % Sales Tax Postage — Add 5% plus \$1.50 Insurance Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30c each Send \$1.00 Postage for your FREE 1983 JAMECO CATALOG Prices Subject to Change



Jameco Calendar Poster 16½ \*\* × 21½ \*\* \$3.95

1355 SHOREWAY ROAD, BELMONT, CA 94002 2/83 PHONE ORDERS WELCOME — (415) 592-8097 Telex: 176043

# **EXPAND YOUR MEMORY**

TRS-80 to 16K, 32K, or 48K
\*\*Model 1 = From 4K to 16K Requires (1) One Kit Model 3 = From 4K to 48K Requires (3) From 4K to 16K Requires (1) One Kit

\*\* Model 1 equipped with Expansion Board up to 48K Two Kils Required

— One Kit Required for each 16K of Expansion —

TRS-16K3 \*200ns for Color & Model III . . . . . . . \$12.95

TRS-16K4 \*250ns for Model I.

# TRS-80 Color 32K or 64K Conversion Kit

Kit comes complete with 8 each 4164-2 (200ns) 64K dynamic RAM and conversion documentation. Converts 178-38 color compute with E-revision boards and 1.1 ROMs to 32K of memory. Min modifications of 32K memory will allow the use of all 64K of the dynamic RAM.

TRS-64K2 (200ns).....

51/4" Mini-Floppy Disk Drive

5 % "MIIII-FIODPY DISK DIIVE FOR TRS-80 MODEL I (Industry Standard) Features single or double density. Recording node: FM single, MFM double density. Power: +12VDC (±0.8Y) 1.58 max., +5VDC (±0.25V) 0.38 max. Unit as pic. at left (does not int) 0.38 max. Unit as pic. at left (does not int) incl. Wit. 3½ lbs. Size: 5½ W x 8 P D x 3½ ° H.







- · Single-Sided
- 400/800K Bytes
- Capacity Industry Standard

The FDD109.8 8° Floppy Disk Drive (Industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250k Disk.5ec. single density. 500k Dist/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Distkette | or eq. disk cartridge. Hard-sectored option available. Power: 115/230VAC e? 5560Hz. + 24VDC & 1.7 amps max. Will as pictured above (does not include case, power supply, or cables). Size: 8.55°W x 14°L x 45°T. Weights 12 bs. Incl. 95-pp. manual.

| PartNo.                          | 13 12 103. IIICI. 30-pg. Illandai. | Price          |
|----------------------------------|------------------------------------|----------------|
| FDD100-8<br>FDD100-8<br>FDD100-8 | Buy 1 for                          | .\$259.95 each |

2708.2716.2732 & 2764 EPROM Programmer

JE664 EPROM PROGRAMMER

8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES Self-Contained — Requires No Additional Systems for Operation

NEW!



Programs, validates, and checks for properly erased EPROMs - Emulate PROMs or EPROMs - RS232C Computer Interface for editing/program lacking - Leads data in RAM by keyboard - Changes data in RAM by keyboard - Changes RAM from an EPROM - Compares EPROMs for content differences - Copies EPROMs - Power Inc. 115VAC, 60Hz, - 4 TOW, power consumption - Enclosure: Cobor-coordinated, light lan panels w/molded mocha brown end pieces - Size: 15-5/8°L x 8W.°D x 3V\*H - Wil: 54 lbs.

JE665 — RS23C INTERFACE OPTION — THE JE665 RS23C Interface Option implements computer access to the JE664's RAM Sample software written in BASIC provided for TRS-80° Model I. Level II Computer. Baud rate: 9500 Werd Lyth. 8 bits - odd parity. Slop bits 2. Option may be adapted to other compouters.

Lym o ones doe parky, slop bits 2. Upino maybe adapted to other Computers, JE6664 – ARS Fendow Prep. wt.JE650 option Assembled and Tested (Includes LM16 A Module) EPROM JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the LFPOM & configures EPROM socket connections for that particular EPROM.

| No.   | EPROM                  | EPROM MANUFACTURER PR                   | ICE   |
|-------|------------------------|-----------------------------------------|-------|
| JM08A | 2708                   | AMD, Motorola, National, Intel, TI \$14 | 1.95  |
| JM16A | 2716,TMS2516           | Intel, Motorola, National, NEC, TI      | 4.95  |
| JM16B | TMS2716                | Motorola, Ti (+5,-12, +12)              | 4. 95 |
| JM32A | TMS2532                | Metorola, TI                            | .95   |
| JM32B | 2732                   |                                         | 1.95  |
| JM64A | MCM68764.<br>MCM68L764 | Motorola                                | 4.95  |
| JM64B | 2764                   | Intel\$1                                | 4.95  |
| JM64C | TMS2564                | TI                                      | 4.95  |

# **UV-EPROM Eraser**



1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive form liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9,00° x 3.70° x 2.50°. Complete with holding tray for 8 chips. UVS-11EL Replacement Bulb . . . . . \$16.95





36cfm free air delivery
 3.125" sq. x 1.665" depth
 10 yrs. cont. duty at 20 °C
 Frame
 115V 50/60Hz

PWS2107U Cleaned & 9.95 ea. \*PWS2107F New ..... \$ 9.95 ea.



Muffin-style Fan 105cfm free air delivery
 4.68" sq. x 1.50" depth.
 10 yrs. cont. duty at 20°C
 Impedance protected, ambients to 70°C

• 115V 50/60Hz 14W Wt. 17 oz. MU2A1-U Cleaned & \$9.95 ea.
\*MU2A-1N New . . . . . . . \$14.95 ea.



VISIT OUR RETAIL STORE AND RECEIVE A 5% DISCOUNT!

3250 KELLER STREET, #9

SANTA CLARA, CA 95050

14.00

39.90

45.00

# 16K APPLE\*II RAM CARI

BARE BOARD **ASSEMBLED** 

# INTERFACE

| 8T26<br>8T28<br>8T95 | 1.65<br>1.95<br>.95 |
|----------------------|---------------------|
| 8T96                 | .95                 |
| 8T97                 | .95                 |
| 8T98                 | .95                 |
| DM8131               | 2.90                |
| DP8304               | 2.25                |
| DS8836               | 1.25                |
|                      |                     |

# 1702 2708 2758 TMS 2516 2716-1 TMS 2716 2532 2732 2764 MC 68764 3.00 2.99 9.75 5.75 3.49 7.85 8.75 7.85 1 ns 4 50ns 5 V 450ns (24 pin) 2101 2102-1 2102L-2 2111 2112 2114 2114 L-3 2114 L-2 2147 6.49 2147 TMS 4044-4 TMS 4044-3 TMS 4044-2 MK 4118 TMM 2016

# DYNAMIC RAMS

**EPROMS** 

| TMS 4027 | 250ns     | 2.00 |
|----------|-----------|------|
| MK 4108  | 200ns     | 1.75 |
| MM 5298  | 250ns     | 1.75 |
| 4116-1   | 150ns     | 1.75 |
| 4116-2   | 200ns     | 1.25 |
| 4116-3   | 250ns     | 1.15 |
| 2118     | 5 V 150ns | Call |
| MK 4816  | 5 V 300ns | Call |
| 4164-200 | 5 V 200ns | Call |
| 4164-150 | 51/ 150ns | Call |

200ns 150ns 120ns 300ns LP = Low Power

TMM2016 TMM 2016 HM6116-4 HM6116-3

STATIC RAMS

450ns 450ns 250ns LP 450ns

450ns 450ns 450ns 300ns LP 200ns LP 55ns 450ns

300ns 200ns 250ns 200ns

150ns

100ns

1.85 .79 1.55 2.49 2.69 1.75 1.85 1.95 8.95 3.50 9.75 5.49 7.49 Call

### RESISTORS

HAWATT 5% CARBON FILM
ALL STANDARD VALUES
FROM 1 OHM TO 10 MEG OHM
50 PCS. SAME VALUE
100 PCS. SAME VALUE
1000 PCS. SAME VALUE

.0200 .0150 .0125

# Beat Any Competitors' Prices!

1 MHZ

5.49 6.90 7.65 9.90 4.35 7.95 9.95 6502 6502 6504 6505 6507 6520 6522 6532 6545

2 MHZ

6502A 6522A 6532A 6545A 9.45 10.95 11.95 6551A 3 MHZ

6502B 11.95

| *Appi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | le is a trad                                                                                                                                                                                                                                                                               | emark of Apple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Computer,                                                                                                                                       | , Inc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                            | 74LS00 SE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RIES                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 74 L S 00 74 L S 10 74 L S 10 74 L S 11 74 L S 12 74 L S 10 74 L S | .24<br>.24<br>.24<br>.24<br>.24<br>.24<br>.30<br>.30<br>.40<br>.30<br>.24<br>.30<br>.24<br>.30<br>.24<br>.35<br>.55<br>.55<br>.35<br>.35<br>.49<br>.37<br>.36<br>.37<br>.37<br>.38<br>.39<br>.49<br>.49<br>.39<br>.49<br>.39<br>.39<br>.39<br>.39<br>.39<br>.39<br>.39<br>.39<br>.39<br>.3 | 74LS123<br>74LS124<br>74LS125<br>74LS132<br>74LS133<br>74LS133<br>74LS133<br>74LS148<br>74LS145<br>74LS155<br>74LS156<br>74LS156<br>74LS156<br>74LS160<br>74LS160<br>74LS161<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS163<br>74LS173<br>74LS193<br>74LS193<br>74LS193<br>74LS194<br>74LS194<br>74LS194<br>74LS194<br>74LS194<br>74LS241<br>74LS241<br>74LS241<br>74LS241<br>74LS241<br>74LS243<br>74LS244<br>74LS244<br>74LS244<br>74LS244<br>74LS248 | .95<br>2.95<br>.75<br>.75<br>.75<br>.75<br>.75<br>.75<br>.75<br>.75<br>.75<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.9 | 74 LS253<br>74 LS258<br>74 LS258<br>74 LS258<br>74 LS260<br>74 LS260<br>74 LS273<br>74 LS275<br>74 LS283<br>74 LS293<br>74 LS293<br>74 LS293<br>74 LS353<br>74 LS364<br>74 LS365<br>74 LS366<br>74 LS366<br>74 LS373<br>74 LS374<br>74 LS379<br>74 LS386<br>74 LS379<br>74 LS379<br>74 LS379<br>74 LS389<br>74 LS389 | .8000<br>.8000<br>.8000<br>.8009<br>.8009<br>.8009<br>.8009<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.80999<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.8099<br>.809 |
| 7415113                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | .39                                                                                                                                                                                                                                                                                        | 7415240                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.20                                                                                                                                            | 81LS96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| AY5 1014<br>AY5 1013<br>AY5 2376<br>TR 1602<br>1M 6402<br>1M 6403                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5.85<br>3.90<br>10.95<br>3.90<br>7.85<br>8.85                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| LED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | S                                                                                                                          |
| lumbo Red<br>lumbo Green<br>lumbo Yellow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10/1.00<br>6/1.00<br>6/1.00                                                                                                |
| DIP SWIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CHES                                                                                                                       |
| 4 Position<br>5 Position<br>6 Position<br>7 Position<br>8 Position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | .85<br>.90<br>.90<br>.90                                                                                                   |
| EXAF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                            |
| XR 2206<br>XR 2207<br>XR 2208<br>XR 2211<br>XR 2240                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.75<br>3.75<br>3.90<br>5.25<br>3.25                                                                                       |
| RCA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.5                                                                                                                        |
| CA 3010<br>CA 3013<br>CA 3023<br>CA 3035<br>CA 3039<br>CA 3053<br>CA 3053<br>CA 3055<br>CA 3065<br>CA 3065<br>CA 3081<br>CA 3082<br>CA 3083<br>CA 3083<br>CA 3083<br>CA 3086<br>CA 3083<br>CA 3086<br>CA 3083<br>CA 3086<br>CA 3146<br>CA 3160<br>CA 3146<br>CA 3160<br>CA 3146<br>CA 3160<br>CA 3146<br>CA 3160<br>CA 3146<br>CA 3160<br>CA 316 | .95<br>1.95<br>2.75<br>2.49<br>1.25<br>1.25<br>1.25<br>1.45<br>1.65<br>1.65<br>1.65<br>1.15<br>1.15<br>1.15<br>1.15<br>1.1 |

**UARTS** 

|                                                                                                                                                                     |                                                                                                                                                                                                     | CM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | os                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 150                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4000<br>4001<br>4002<br>4006<br>4007<br>4009<br>4010<br>4011<br>4012<br>4013<br>4014<br>4016<br>4017<br>4024<br>4024<br>4024<br>4024<br>4024<br>4024<br>4024<br>402 | .25<br>.30<br>.30<br>.30<br>.925<br>.945<br>.90<br>.945<br>.90<br>.95<br>.90<br>.95<br>.75<br>.90<br>.95<br>.95<br>.95<br>.90<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95<br>.95 | 40938<br>40938<br>40998<br>450038<br>45112<br>45118<br>45112<br>455118<br>455112<br>455122<br>455122<br>455128<br>455128<br>455128<br>455128<br>455128<br>4551884<br>455885<br>8000000<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014<br>7740014 | 90<br>90<br>2,49<br>1,90<br>1,90<br>1,90<br>1,90<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,20<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90<br>1,90 | 74C89 74C90 74C93 74C95 74C151 74C151 74C151 74C161 74C163 74C163 74C164 74C165 74C173 74C193 74C193 74C193 74C192 74C902 74C915 74C902 | 4.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755<br>1.755 |
| 4071<br>4072<br>4073                                                                                                                                                | .30<br>.30<br>30<br>.30                                                                                                                                                                             | 74C32<br>74C42<br>74C48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | .50<br>1.75<br>1.20<br>.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 74C927<br>74C928<br>74C929<br>74C930                                                                                                                                                                                                                                                                                                                                           | 7.95<br>19.95<br>19.95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4075<br>4076<br>4078<br>4081<br>4082<br>4085                                                                                                                        | .30<br>.90<br>.30<br>.30<br>.30                                                                                                                                                                     | 74C73<br>74C74<br>74C76<br>74C83<br>74C85<br>74C86                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | .65<br>.85<br>.80<br>1.95<br>1.95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 14409<br>14410<br>14411<br>14412<br>14419                                                                                                                                                                                                                                                                                                                                      | 12.90<br>12.90<br>11.90<br>12.90<br>4.90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

Computer Products, Inc. 3250 Keller Street, #9 Santa Clara, CA 95050 (800) 538-8800

Calif. Residents (800) 848-8008

Local Phone (408) 988-0697 STORE HOURS: MON-FRI 8:30 A.M.-6:00 P.M. SAT 10:00 A.M.-3:00 P.M.





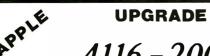
TERMS: For shipping include \$2.00 for UPS Ground. \$3.00 for UPS Blue Label Air. \$10.00 minimum order. Bay Area residents add 6½% Sales Tax. California residents add 6% Sales Tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

# APPLE\*II USERS DISK DRIVE!

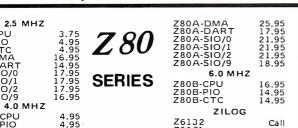
Includes metal cabinet Color matches Apple

35 Tracks/single side Includes cable Use with Apple II Controller

WITH CONTROLLER CARD - 359.95



4116 - 200 ns 8/10.00





# Products,

VISIT OUR RETAIL STORE AND RECEIVE A 5% DISCOUNT!

3250 KELLER STREET, #9

SANTA CLARA, CA 95050

# Diskettes

ATHANA SS SD SOFT. . . . 23.95 ATHANA SS DD SOFT . . . 24.95

ATHANA DS DD SOFT . . . 31.95

BULK SS DD SOFT

**\$ 1.85** ea.

# LINEAR

| LM301<br>LM308<br>LM309K<br>LM311<br>LM317T<br>LM317K<br>LM323K<br>LM323K<br>LM323K<br>LM327<br>LM339<br>LM337<br>LM339<br>LM355<br>LM556<br>LM566 | 32<br>75<br>1.25<br>1.65<br>1.70<br>1.49<br>3.75<br>3.90<br>2.25<br>1.25<br>1.38<br>.65<br>1.45 | í | LM 7-11<br>LM 7-47<br>LM 7-48<br>LM 1-3-10<br>MC 1-3-50<br>MC 1-3-58<br>LM 1-4-58<br>LM | .29<br>.75<br>.49<br>2.45<br>1.69<br>1.49<br>.55<br>.95<br>2.45<br>2.45<br>2.45<br>3.70<br>3.70 |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                                                                                                                                                    |                                                                                                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3.70                                                                                            |
| LM567                                                                                                                                              | .99                                                                                             |   | 75451                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | .35                                                                                             |
| LM723<br>LM733                                                                                                                                     | .49<br>.95                                                                                      |   | 75452<br>75 <b>453</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | .35                                                                                             |

# CLOCK CIRCUITS

280-CPU Z80-PIO Z80-CTC Z80-DMA Z80-DART Z80-SIO/0 Z80-SIO/1 Z80-SIO/2 Z80-SIO/2

Z80A-CPU Z80A-PIO Z80A-CTC

MM 5314 4.90 MM 5369 3.90 MM 5375 4.90 MM 58167 8.90 MM 58174 10.95

MSM 5832 6.90

ORDER TOLL FREE 538-8800

(CALIFORNIA RESIDENTS) ALL MERCHANDISE IS 100% GUARANTEED

# Disc Controllers

| 1771<br>1791<br>1793<br>1795<br>1797<br>1691 | 16.00<br>27.95<br>29.95<br>49.95<br>49.95<br>17.95<br>34.95 |
|----------------------------------------------|-------------------------------------------------------------|
| UPD 765                                      | 34.95                                                       |

### 9000 SERIES 316 3334 95 368

7805T 7808T 7812T 7815T

7824T

7805K 7812K 7815K

7824K

7905T

11 C 90 3242 MC 3470 MC 3480 6.95 7.95 8.95 2.39 3.69 8.95 ULN 2003 CA 3146 2513-001 up 5.95 1.75 9.69 9401 9601 .69 36 O 2 36502 2513-002 low 9.69

**VOLTAGE REGULATORS** 

7908T 7912T

7915 T 7924 T

7905K 7912K 7915K

7924K

T = TO-220 K = TO-3

.85 .85

.85

1.39 1.39 1.39

1.39

.75 .75 .75 .75

1.29 1.29 1.29 1.29

.85

# **CRYSTALS**

| 32.768 KHZ | 1.90 | 5.185    | 3.90 |
|------------|------|----------|------|
| 10 MHZ     | 4.50 | 5.7143   | 3.90 |
| 1.8432     | 4.50 | 6.5536   | 3.90 |
| 2.0        | 3.90 | 8.0      | 3.00 |
| 2.097152   | 3.90 | 10.0     | 3.00 |
| 2.4576     | 3.90 | 14.31818 | 3.90 |
| 3.2768     | 3.90 | 18.0     | 3.00 |
| 3.579545   | 3.00 | 18.432   | 3.00 |
| 4.0        | 3.00 | 20.0     | 3.00 |
| 5.0        | 3.00 | 22.1184  | 3.00 |
| 5.0688     | 3.90 | 32.0     | 3.90 |
|            |      |          |      |

8 PIN 14 PIN 16 PIN 18 PIN 20 PIN 22 PIN 24 PIN 28 PIN .49 .10 .12 .15 .20 .25 .25 .25 .57 .85 .99 1.30 1.40 1.50 1.80 .40

ST = Soldertail W/W = Wirewrap

# IC Sockets

8 MHz 68000 95.95

6800 1 MHz

6800

6802 6808

6809 6809 E 6810

6820 6821 6828

6840

6844 6845 6847

6850

6852

6883

68B00 68B02

68B09

68B09

68B10 68B21

4.75 8.65 8.45 11.95

17.95 17.95 2.90 3.50 3.50 14.90

7.95 32.95 32.95 16.90 11.95 3.50 10.90 1.80 22.95

10.00 21.95 28.95 29.90 7.90 12.00

34.00

# CONNECTORS

RS232 Male RS232 Female RS232 Female Right Angle 3.50 4.95 RS232 Femal RS232 Hood 30 pin Edge 44 pin Edge 50 pin Edge 86 pin Edge 100 pin ST 100 pin W/W 1.20 2.49 2.49 2.69 3.90

# 8000

| 8035                                                                                         | 6.95                                                                                              | 8239                                                                                             | 4.75                                                                   |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 8039                                                                                         | 7.59                                                                                              | 8243                                                                                             | 4.75                                                                   |
| 8080A                                                                                        | 3.90                                                                                              | 8250                                                                                             | 14.90                                                                  |
| 8085 A                                                                                       | 7.95                                                                                              | 8251                                                                                             | 4.50                                                                   |
| 8088                                                                                         | 34.95                                                                                             | 8253                                                                                             | 8.75                                                                   |
| 8155                                                                                         | 7.75                                                                                              | 8253-5                                                                                           | 9.75                                                                   |
| 8156                                                                                         | 8.75                                                                                              | 8255                                                                                             | 4.50                                                                   |
| 8185<br>8741<br>8748<br>8755<br>8202<br>8205<br>8212<br>8214<br>8216<br>8224<br>8226<br>8228 | 29.00<br>39.00<br>14.95<br>29.95<br>27.95<br>3.45<br>1.80<br>3.75<br>1.75<br>2.45<br>1.80<br>4.50 | 8255-5<br>8257<br>8259<br>8272<br>8275<br>8279<br>8279-5<br>8282<br>8283<br>8284<br>8286<br>8287 | 5.20<br>8.50<br>6.85<br>39.00<br>29.25<br>9.95<br>6.50<br>5.50<br>6.50 |
| 8237                                                                                         | 19.00                                                                                             | 8288                                                                                             | 25.00                                                                  |
| 8238                                                                                         |                                                                                                   | 8289                                                                                             | 49.00                                                                  |

# Power Supplies

MOUNTED ON PC BOARD MANUFACTURED BY CONVER +5 VOLT 4 AMP ±12 VOLT 1 AMP



34.95



QU Computer Products, Inc. 3250 Keller Street, #9 Santa Clara, CA 95050 (800) 538-8800

Calif. Residents (800) 848-8008

**Local Phone** (408) 988-0697 STORE HOURS: MON-FRI 8:30 A.M.-6:00 P.M. SAT 10:00 A.M.-3:00 P.M.





TERMS: For shipping include \$2.00 for UPS Ground. \$3.00 for UPS Blue Label Air. \$10.00 minimum order. Bay Area residents add 6% Sales Tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

# 16K Apple Ramcard



**LIST 195** ACP \$5995

- Full 1 year warranty
- Expand Apple II 48K to 64K
- Compatible with 7-80 Softcard
- Allows system to run with CP/M™, PASCAL DOS 3.3, COBAL, Visicalc, etc.
- Supplied with extra 16K RAM& has (2) LED's

# 32K STATIC RAM 2 or 4 MHz



Expandable 2114L's

\$159.95 217.95 289.05 16K 4 MHz Kit 16K 4 MHz A&T 32K 4 MHz Kit 32K 4 MHz A&T • 339.00 39.95 99.95

# BARE BOARDS

S-100 Sound Board 8080A CPU \$34.95 8080A CPU
32K Static RAM (2114)
8K EPROM (2708)
27 08/2716 E PROM
AC P Proto B oard
Vector 8800 Proto
Vector 8803 11 slot MB
ACP Extender with connector
13 Slot Mother Board (WMC)
9 Slot Mother Bolard (WMC)
9 Slot Mot 34.95 34.95 24.95 34.95 22.95 22.20 29.95 18.95 32.95 29.95 34.95 39.95 S100 (AY5-8910) Sound Board Apple Sound Board

"EPROM"

**ERASER** 

Model

UVs-11E

\$79.95

\$325.00

# **64K CMOS RAM**

S100 (200nS) Uses 2716's \$299<sup>00</sup>

or 6116's Assembled & Tested \$399.00

# MOSTEK RAMS

200,000 pieces in stock — priced to move. stock — priced to move. Same as MK4027 except 1mS refresh. MK4015 4Kx1 RAM.

# STEPPER MOTOR



Operates by applying 12VDC in one direction and then reversing polarity (or square wave). Uses 12VDC, Clock Wise Rotation, Rated 3 RPM at 4 P.P.S. with a 5 degree stepping angle.

# **4K STATIC RAM**

Same as TMS4044 but designed specifically

# 16K Memory Expansion Kits for Apple/TRS-80

200/250nS 200/250nS Specify computer \$12.95 CALL FOR VOLUME PRICING

# "D" SUB CONNECTORS



Model S.52T

Specify 25 or 37 pins

BD37 \$2.50 DB25 \$1.95

# Astec RF Modulator



for COLOR B/W \$6.95

P/N 1082 Channel 3 or 4

# 1200 BAUD MODEM IC



• 5Volts Only

495 ea. 10 for \$39.95

# SELL-OFF 10/\$9,90

for Z-80 based systems. This is a full-spec 4Kx1 RAM, 450nS.

Order P/N Zilog 6104-4 while supply lasts

# Zilog **Z8 CPŪ** with TINY BASIC

\$49.95 Debug prog. Plus 6132 companion

# quasi-static RAM Stepper Motor



USED IN DATA **PRODUCTS PRINTER** \$19.95 ea

# CONNECTORS



| ١ |                            |        |
|---|----------------------------|--------|
|   | DB25P (RS232)              | \$3.25 |
| Į | DB25S Female               | 3.75   |
| ١ | Hood                       | 1.25   |
| ı | Set with Hood, Sale        | 7.50   |
| ١ | 22/44 S/T, KIM             | 2.95   |
| ı | 43/86 S/T, MOT             | 6.50   |
| ١ | 50/100 S-100 Connector W/W | 4.95   |
| ١ | 50/100 S-100 Connector S/T | 3.95   |
|   |                            |        |

# PARALLEL ALPHA NUMERIC

19 Column Printer prints 16 numerical columns plus 3 columns which have math, alpha and other notations. Each wheel has 12 positions with position 12 blank. Position 11 on numerical columns have decimal point or #. Utilizes 2.75

wide adding machine tape and a dual color ink ribbon input data parallel withfour bitBCD comparator circuit(schematic provided). Print rate, 3 lines per second. Operating voltage 22-28 WDC with typical cycle time of 340mS. Size 6½"W x 3¾"H x 5¾"Dp. New. \$9.95 ea. 3/\$27

# **MICROPROCESSORS**

|        |         | RAN    | 1S      | CALLF | PRICIN |
|--------|---------|--------|---------|-------|--------|
| 85     | 14.95   | 6800B  | 19.95   | 68000 |        |
| BOA    | 4.75    | 6800   | 11.75   | 8086  | 49.95  |
| 02     | 9.75    | IM6100 | 29.95   | 6809  | 30.00  |
| 50     | 16.95   | 6502A  | 16.95   | 8748  | 49.95  |
| (3850) |         | 6502   | 9.95    | 8755  | 49.95  |
| OA     | 11.95   | 9900JL | 49.95   | 8073N | 34.95  |
| 0      | 9.95    | 2901A  | 14.95   | 8039  | 12.95  |
| 002    | 69.00   | 2901   | 9.90    | 8035  | 14.95  |
| 001    | \$99.00 |        | \$14.95 | 6802P | 14.95  |
|        |         |        |         |       |        |

Z8 Z8 Z8 Z8 F-8 26: 18: 80:

5.99 4.69 .99 .99 4.69 3.99 411 414 1101 1103 4027 4044 4050 4060 8/12 21L02-4 2111 2112 2114 2114L-2 2114L-4 4096 3.99 1.99 3.25 2.29 6.99 4115 7.95 1.99 4.60

4402 5280

4.50 6.79 3.79 3.99 7.99 8.99 8.99 6.99 6518 6561 6604 6605 9130 9140 LM337K LM338K LM339N LM340K-XX\* LM340T-XX\* LM340H-XX\* LM344H LM348N LM350K LM358CN LM356ON LM356ON 93415 93425 6 99 84X only \$5.95 SUPPORT \$22.95

LINEAR

\$5.95

1.49 1.49 2.95 .99 .35 1.98 1.89 3.25 .29 .98 1.49

1.25 .89 1.75 1.70

1.49 1.25 1.35 1.39 1.25 4.95 .95 6.95

.95 1.75 1.25

1.25 1.95 1.20 5.60 .98 1.49

1.79 1.95

1.25

1.40

1.95 3.75 .39 .98 19.95 1.25 1.75 1.50

2.75 1.99 .29

.39 1.95 .65 .98 1.15 .33 .19 .75 .39 2.95 1.90

1.95 1.75

74S124 74S133 74S134 74S135

74\$136 74\$138 74\$139 74\$140 74\$151 74\$153 74\$157 74\$158 74\$174 74\$174 74\$175

74S194 74S195

745196

74S240 74S241 74S242 74S243 2.75 2.75

1.29 1.29 .73 1.29 1.29 1.29 2.79 1.49 1.49 2.69

1.89 1.89 1.89

74500

78H05K 78M06 78M.G. LM108AH LM300H LM301CN LM304H LM305H LM306H

LM307CN LM308CN LM309K

LM309K LM310CN LM311D/CN LM312H LM317T LM318CN LM319N/H LM320K-XX\*

LM320K-XX\* LM320T-XX\* LM320H-XX\* LM323K

LM324N

I M337K

LM372N

LM377N

LM381N LM383T

LM383T LM386N LM387N LM390N NE531V/T NE555V NE556N NE561T NE565N/H NE566H/V NE566H/V

NE592N LM702H

LM702H LM709N/H LM710N/H LM711N/H LM715N LM723N/H LM733N/H LM739N LM741CN/H LM741CN-H

LM747N/H

LM748N/H

LM760CN LM1310N MC1330

MC1350 MC1358

74S00 \$ .39
74S02 .43
74S03 .45
74S04 .52
74S04 .52
74S06 .59
74S06 .49
74S10 .42
74S11 .42
74S15 .42
74S16 .42
74S16 .42
74S16 .42
74S17 .42
74S18 .49
74S18 .41
74S18 .41
74S19 .49
74S14 .49
74S14 .49
74S14 .49
74S14 .49
74S14 .59
74S15 .72
74S112 .72
74S112 .72
74S112 .72

LM380CN/N

LM1414N LM1458CN/N MC1488N MC1489N LM1496N LM1556N LM1820N LM1850N LM1889N LM2111N LM2900N

LM2900N LM2901N LM2917N CA3013T CA3021T CA30221T CA3023T CA3035T CA3039T CA3046N LM3053N CA3059N CA3060N CA3062N

CA3062N LM3065N CA3080T CA3081N CA3082N CA3083N CA3086N CA3089N CA3096N CA3097N CA3130T CA3146N

CA3160T CA3190N

CA3190N CA3410N MC3423N MC3460N

MC3460N SG3524N CA3600N LM3900N LM3905N LM3909N LM3914N LM3915N LM3916N

LM3916N RC4131N RC4136N RC4151N RC4194TK RC4195TK

ULN2001 ULN2003 SN75450N SN75451N SN75452N SN75453N SN75454N

SN75491N SN75492N SN75493N SN75494N

TL494CN TL496CP

\$1.90 .49 .99 .89 1.50 .95 3.10 1.75 .99 2.50 2.95 2.19

7400

7475 7476

7492 7493

7494

74123 74125

74126 74128

74LS00

74LS113\$

.43 .55 1.19 1.35 .89 .52 .79 .49 .85 .85

2.20 1.15 1.15 .98 .98 1.15 .95 .89 1.15 1.69 1.69

CMOS

95 85 85 1.75 1.25 99 45 1.10 1.10 1.10 1.10 1.10 1.39 3.29 5.35 3.35 3.35 3.35 3.35 1.95 1.95

74LS114
74LS122
74LS123
74LS124
74LS126
74LS126
74LS139
74LS139
74LS146
74LS139
74LS146
74LS156
74LS156
74LS157
74LS166
74LS156
74LS166
74LS156
74LS166
74LS167
74LS168
74LS169
74LS168
74LS169
74LS169
74LS169
74LS173
74LS189


.19 .22 .22 .22 .23 .35 .26 .23 .29 .29 .29

74LS11 74LS12 74LS13 74LS14 74LS15 74LS20 74LS21 74LS22 74LS26 74LS27 74LS28 74LS28 74LS30 74LS30

74LS32 74LS33 74LS37 74LS38 74LS40 74LS42 74LS47 74LS51 74LS54

74LS75

74LS78 74LS83/ 74LS85

74LS85 74LS86 74LS90 74LS92 74LS93 74LS95 74LS96 74LS107 74LS109 74LS112

4000 \$ .35 4001 .35 4002 .35 4006 1.05 4007 .25 4008 1.39 4009 .45 4010 .45

.25 1.39 .45 .45 .35 .25

1.39 1.15 .59 1.19 .89 .45 1.10 1.19

4023 4024 4025 4027 4028 4029 4030 4031 4032 4034 .29 .75 .25 .65 .85 1.29 .45 3.25 2.15

1.19 1.95 1.49 3.95 3.95 3.395 3.395 3.75 2.95 1.10 4.95 5.40 1.25 1.59 4.95 4.95 8.99 8.99

.89 4.20 1.65

1.35 1.35 1.29 1.29 1.29 2.79 2.99 2.55 3.10 3.10 2.75 7.95 7.95 9.95

9.95 5.75 5.75

74S244 74S251 74S253 74S257

74S258

74S260 74S280 74S287 74S288 74S373 74S374 74S387 74S471 74S472 74S473 74S474

74S475 74S570

74S571 74S572

74S573

(diadatata)

\$1.39

1.49 1.65 1.69

\$ .38 .34 4.60

74161 \$ .88 74162 .89 74163 .87 74164 .87

.89 .87 .87 1.20 1.95 1.69 4.75 .79 .89 .85 .75 .75

.75 1.75

74LS247 1.07
74LS249 1.10
74LS249 1.10
74LS249 1.10
74LS251 1.40
74LS253 1.40
74LS258 9.95
74LS260 6.59
74LS266 5.97
74LS261 9.99
74LS283 9.99
74LS283 9.99
74LS283 1.10
74LS2

74LS352 74LS353 74LS363 74LS368 74LS368 74LS367 74LS377 74LS377 74LS377 74LS375 74LS375 74LS393 74LS393 74LS393 74LS398 74LS398 74LS398 81LS98 81LS98 81LS98 81LS98

VOLUME PRICING
CALL
TOLL FREE

1.95 1.70 2.35 2.95 1.75 2.29 1.69 1.69 1.69

\$2.95 .99 2.95 2.29 2.25 12.95 12.95 12.95

8.95 4.95

39 1.65 .69 8.95 .75 .95 3.75 1.19 1.39 2.75 1.45 1.25 4.95 .99 2.50 1.25

8259\$8.95 88047 8155 \$9.95 8156 9.95 8259\$8.95 8275 19.95 8279 9.50 6810 4.75 6820 6.50 6821 6.50 19.95 22.95 6.95 8202 29.95 8205 2.69 8212 2.75 6520 8212 8214 8212 2.75 8214 4.95 8216 2.75 8224 2.95 8226 2.95 8228 3.95 8243 9.50 8250 14.95 8251 6.50 8253 11.95 8255 4.50 8257 9.50 6828 10.50 6834 16.95 6845 22.95 6847 27.95 6850 5.25 8852 5.25 6860 10.95 6862 10.95 6532 6551 Z80-PIO Z80A-PIO Z80-CTC Z80A-CTC 19 95 Z80-DMA Z80A-DMA 19.95 27.95 24.95 29.95 6875 5.95 6880 2.49 Z80-SIO Z80A-SIO

# MOS PROMS

| 2764 (8Kx8) TS<br>2732 (4Kx8) TS<br>2716 (2516; 5V<br>(2Kx8) TS<br>TMS2716, 5V, 12V<br>2758, 5V, (450nS) | \$69.95<br>12.95<br>7.95<br>17.95<br>3.50 | 2708 (450nS)<br>2708 (650nS)<br>1702A<br>MM5203AQ<br>MM5204Q |  |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------|--|
| 2730, 34, (43013)                                                                                        | 0.00                                      |                                                              |  |

# HI-TECH

| 2513-001 (5V)Upper       | \$9.50 | DAC08                    | \$9.95  |
|--------------------------|--------|--------------------------|---------|
| 2513-005(5V) Lower       | 10.95  | DAC100                   | 9.95    |
| 2513-ADM3(5V) Lower      | 14.95  | 8038 Function Generator  | 4.50    |
| MCM66710ASCII Shifted    | 12.95  | MC4024 VC0               | 2.95    |
| MCM66740MathSymbol       | 13.95  | LM566 VCO                | 1.95    |
| MCM66750 AlphaControl    | 13.45  | XR2206 Function Generali | or 5.25 |
| 1771-01 8 " & Minifloppy | 24.95  | TR1602B (5V, 12V)        | 39      |
| 1781 DualFloppy          | 29.95  | AY51013 (5V, 12V)        | 4.9     |
| 1791-01 Dual Floppy      | 36.95  | AY51014A/1612 (5-14V)    | 6.9     |
|                          | 44.95  |                          | 6.9     |
| 1793DD, DS Floppy        | 44.95  | IM6402                   | 7.9     |
| 1797DD,DS Floppy         |        |                          | 8.9     |
| 1691 Data Separator      |        |                          | 9.9     |
|                          |        |                          | 24.9    |
| 87008 bit 8inary         |        |                          | 11.9    |
| 8701 10 bilBinary        | 22.00  |                          | 14.95   |
| 8703 8 bitTS             | 13.50  |                          | 9.9     |
|                          | 7.25   |                          | 16.9    |
| 87503½ DigitBCD          | 13.95  |                          | 15.9    |
| 1408L6 6 bi1             | 3.95   |                          | 13.7    |
| 1408L88 bit              | 5.95   |                          | 13.7    |
| DACO1 DIOA               | 5.95   | MM5740AAC                | 8.9     |

# SOCKETS

### LOW PROFILE SOCKETS (TIN) 25-49 1-24 50-100

| 8 pin LP  | .16 | .15 | .14 |
|-----------|-----|-----|-----|
| 14 pin LP | .20 | .19 | .18 |
| 16 pin LP | .22 | .21 | .20 |
| 18 pin LP | .29 | .28 | .27 |
| 20 pin LP | .34 | .32 | .30 |
| 22 pin LP | .29 | .27 | .24 |
| 24 pin LP | .38 | .37 | 36  |
| 28 pin LP | .45 | .44 | .43 |
| 40 pin LP | .60 | .59 | .58 |
|           |     |     |     |

# **3L WIREWRAP** SOCKETS (GOLD)



| 1-24 | 25-49                                                   | 50-100                                                                                                  |
|------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| .55  | .54                                                     | .49                                                                                                     |
| .65  | .63                                                     | .58                                                                                                     |
| .75  | .73                                                     | .67                                                                                                     |
| .60  | .77                                                     | .70                                                                                                     |
| .95  | .90                                                     | .81                                                                                                     |
| 1.15 | 1.06                                                    | .99                                                                                                     |
| 1.45 | 1.35                                                    | 1.23                                                                                                    |
| 1.35 | 1.26                                                    | 1.14                                                                                                    |
| 1.60 | 1.53                                                    | 1.38                                                                                                    |
| 2.20 | 2.09                                                    | 1.89                                                                                                    |
|      | .55<br>.65<br>.75<br>.80<br>.95<br>1.15<br>1.45<br>1.35 | .55 .54<br>.65 .63<br>.75 .73<br>.80 .77<br>.95 .90<br>1.15 1.06<br>1.45 1.35<br>1.35 1.26<br>1.60 1.53 |

# **SWITCHES**



| Position<br>Position<br>Position<br>Position | \$ .99<br>1.19<br>1.29<br>1.35 |  |
|----------------------------------------------|--------------------------------|--|
|                                              |                                |  |

| osition | 1.35  | 10 Position |
|---------|-------|-------------|
| osition | 1.29  | 9 Position  |
| osition | 1.19  | 8 Position  |
| osition | S .99 | 7 Position  |

# MUFFIN® FAN



The dependable, low cost, largest selling fan ercial cooling applications.

105ctm free air delivery 4.68" sq. x 1.50" deep. Weight - 17 oz.

SPECIAL PURCHASE NEW \$9.50 az

# COLIT CDECIAL

| <b>5</b> U | PEK      |                     | LUZ      | ľ | <b>-UU I</b> | <b>3</b> PI | CUIAL    | .O     |
|------------|----------|---------------------|----------|---|--------------|-------------|----------|--------|
| JLN2003    | 2/\$1.99 | 2N6121              | 3/\$1.00 |   | 8080A CPU    | 2.95        | 5027 CRT | \$9.95 |
| 4LS668     | 3/1.99   | SIG 2652            | 3.95     |   | 2102 RAM     | .75         | 11C24    | 6.95   |
| 4LS377     | 2/1.99   | 74S287              | 1.95     |   | 4060 RAM     | 1.49        | 95H03    | 2.89   |
| 74LS241    | 2/1.99   | 2758 EPROM          |          |   | 8X300 CPU    | 14.95       | MM5320   | 5.99   |
| 3259       | 6.95     | 74173/8 <b>T</b> 10 | 5/1.99   |   | 74S387       | 1.96        | 9131 RAM | 1.99   |
| 5561 RAM   | 2.95     | Z80A CPU            | 4.95     | • | 2708EPROM    | 8/29.95     | EMM4402  | 1.99   |
| LM733CN    | 3/1.99   | 6522                | 6.95     |   | 74LS93       | 3/1.00      | 1103 RAM | 3/1.50 |
| MC1414     | 3/1.99   | 6502 CPU            | 5.95     |   | 2114 .       | 8/14.50     | 8700A/D  | 2/16.9 |
|            |          |                     |          |   |              |             |          |        |

Mail Order: P.O. Box 17329 Irvine, CA 92713 800

Retail: 1310BE. Edinger, Santa Ana CA 92705 (714) 558-8813 542 W. Trimble, San Jose, CA 95131 (408) 948-7010

Bank Wire... ssing Include Drives sa, AMEX. CB add 3% handling or \$2.50 checks allow 2 weeks for processin License and credit card #s Visa, service charge. Add 3% shipping & whichever is greater. Add 10% for US Parcel Post Include Telephone Prices subject to change without in subject to prior sale. We reserve the manufacturer. Retail prices may va

S COMPUTER

Vision 80

as reviewed in

May BYTE pg. 266

This is the widely discussed

Cadillac 80 column card for the

UNBEATABLE

**ADD-ON PRICES!** 

Apple II. The Vision 80 responds to more Apple text screen commands than

used as an intelligent terminal

MICROSOFT RAMCARD

64K EXPANDABLE ......

ASTADVANCED COMMUNICATIONS

AST MEMORY CARD

■ 256K SP

INTERFACE CARDS

• EXTENDER CARD.

**EPSON** 

Apple I/O w/cable Serial I/O w/cable

Serial I/O w/2k & cable

MEMORY

ny other board. It supports PASCAL, Microsofts Z80 Softcard and can be

List Price....\$395.00 Special Low Price....\$269.00

The Vision 80 can also be used in conjunction with the Vision 40 (allows enhanced character sets) and the Vision 20 for lower case.

192K with IBM SUPERCALC, Serial, Parallel Clock ...... 459

• 256K w/RAMDRIVE.....

PROTOTYPE CARD .....

EPSON ADD-ON PRINTER....

SUPR'MOD V RF MODULATOR.....

\$429

129.00

89.00 29.95

COMPARE

VISTA 576K Expandable In 64K Increments





 Truly Portable 18 lbs.
 Includes: CP/M\*,
Wordstar-plus\* Basic 80, Valet & Charton Includes: (2) Double Density, Double Sided thin

drives. • 380K Bytes ea ACP PRICE ..... \$ CALL

# KAYCOMP II



Full 9" Green Screen CP/M Based Portable Business Computer

 Complete w/CP/M 2.2 M BASIC, Magic Worksheet, Selec Word Processing, and ACP Price ......only \$1795



| MODEL                | LIST      | ACP     |
|----------------------|-----------|---------|
| 800 with 16K         | \$1080.00 | \$ CALL |
| 800 with 48K         | 1280.00   | 549.00  |
| 800 with 32K + 128K  |           | CALL    |
| 810 Disk Drive       | 600.00    | 469.95  |
| 825 Printer          | 999.00    | 699.95  |
| 830 Acoustic Modem   | 199.00    | 159.95  |
| 850 Interface Module | 219.95    | 189.95  |
| Atari Visicalc       | 200.00    | 169.00  |
| Atari PAC-MAN        |           | CALL    |
| Microtek 16K RAM     | 99.00     | 75.00   |
| Microtek 32K RAM     | 199.00    | 149.00  |
| Axalon 128K RAM      |           | CALL    |
| 400 with 16K         | 399.95    | 329.95  |

51/4" Cabinets with Power Supply Single cabinet w/power supply .... \$69.95

Dual cabinet w/powersupply ..... 94.95



# 51/4" DISK DRIVES

| TM100-1 | SSDD  | \$199.00 |
|---------|-------|----------|
| SA400   | SSDD, | 225.00   |
| TM100-2 | DSDD  | 268.00   |
| TM100-3 | SSDD, | 268.00   |
| TM100-4 | D\$DD | 374.00   |
| B-51    | SSDD  | 224.95   |
| B-52    | DSDD  | 334.95   |
| B-91    | SSDD  | 259.00   |
| B-92    | DSDD  | 459.9    |
|         |       |          |

# 8" DISK DRIVES

| SA801 R      | SSDD               | \$386.00 |
|--------------|--------------------|----------|
| SA851 R      | DSDD               | 525.00   |
| TM848-1      | SSDD               | 369.00   |
| TM848-2      | DSDD               | 499.00   |
| DT-8         | DSDD               | 499.00   |
| FDD100-8     | SSDD               | 199.00   |
| FDD200-8     | DSDD               | 399.00   |
| V1000        | Case/Power Supply. | 375.00   |
| Dual 8" Powe | er Supply          | \$99.00  |
| APPLE        | System Save        | er FAN   |

SANYO

MODEL 4509 9" B/W 5109CX 9" Green 8012C 12" B/W 8012CX 12" Green

6013 13" Color 6113 13" RGB NEW Do 2012 12" B/W 2112 12" Green

FCC CLASS 2 APPROVED

**USI Computer Products** 

LIST ACP \$210 \$169 220 179 250 219 260 229

Surge Suppressor Fan. Double Outlet Receptacle .....

Best of all, the price . . . 00

Optional COEX Interface Card



STARWRITER F-10 ....\$1475 PRO-WRITER 8510A 599

# DIABLO 630



# IDS PAPER TIGER



dot graphics • Proportion • Text justification. LIST ACP Prism 80 IDS Paper Tiger 560G Prism 132 (color) \$899 \$ 699 1395 1099 1995 1875

# COEX 80-FT



COEX

49

49

# OKIDATA



| 82A 120 cps w/tractor,   | \$499.00 |
|--------------------------|----------|
| 83A 120 cps 136 columns  |          |
| 84A-P 200 cps 136 col    | 999.00   |
| 84A-S Serial w/2K Buffer | 1199.00  |
| AppleCard                | 49.95    |
| Apple Cable              |          |
| Serial Card w/2K         | 129.95   |
|                          |          |

# **NEC 8023**



144 x 160 dots/inch Proportional space NEC 8023 . . . . List \$795 ACP \$549

SANYO

EQUIVALENT

MODEL LIST ACP Pil 9" Green \$199 \$159 Pill 12" Green 199 149 Pill 12" Orange 249 199



| 4  | TELEVIDEO   |
|----|-------------|
| 8  | 910C\$599   |
|    | 920C 769    |
| 2  | 925C 749    |
| γ. | 950 969     |
|    | SOROC       |
|    | IQ 120\$695 |
|    | IQ 130 595  |
|    | IQ 140 999  |

# **TERMINALS**

| 14/04/04    | I ELEVIDEO |
|-------------|------------|
|             | 910C\$59   |
|             | 9200 76    |
|             | 925C 74    |
|             | 950 96     |
| The same of | SOROC      |
| (0)         | IQ 120\$69 |
| <b>⊒</b> /  | IQ 130 59  |
| ****        | IQ 140 99  |
| 4 4         | OLL FORF   |

Mall Order: P.O. Box 17329 Irvine, CA 92713

Retail: 1310B E. Edinger, Santa Ana CA 92705 (714) 558-8813 542 W. Trimble, San Jose, CA 95131 (408) 946-7010

# apple computer

\$1530.00 1729.00

LIST \$645.00

525.00 2495.00 24.00 450.00 225.00 195.00 795.00 tore Only

LIST \$395,00

899.00

225.00 195.00

149.95

249 00

127.00

395.00

199.00 29.95

595.00

49.95 129.95

35.00 79.00

259.00

299.00 69.00

375.00

799.00

6450.00

195.00

239.00

425.00 599.00

249.00 349.00 299.00

239.00

750.00 395.00

375.00

350.00 199.00

200.00

155.00 55.00 55.00 175.00

395.00

295.00

69.00 55.00

399.00 349.00 699.00

Apple II 16K

Compatible with

MORE HARDWARE

Apple II Disk II w/Control'r Apple II Disk II w/o Apple II Disk II w/o Apple Family System Prototype Card

IEEE-488 Interface Extended Warranty- 1 yr

Z80 Softcard 16K Ramcard The Premium Package

AIO:114 Function Serial/

Parallel
AIO Serial/Parallel
KEYBOARD COMPANY

Numeric Keypad
Apple II Joystick
Apple II Handcontrollers
PROMETHEUS

VERSAbox Spool/Bufr VERSAcard Four-in-1 AUTO-DOC diagnostics VISTA COMPUTER CO.

Vision 80 80x24 Card Vision 40 40 col

enhance
Vision/20 Lo case ROM
A8008\* DS, DD
Quartet Disk Drive
Duel Disk Drive
Solo Disk Drive
40 Char Type-ahead
Wild Card
VIDEX
Videoterm 80x24 Card
Keyboard Enhancer II
Soft Switch
Eurorino Strin Keys

Furiction Strip Keys PRACTICAL PERIPHERALS

PRACTICAL PERIPHERA
IBK Microbuller
32K Microbuller
32K Microbuller
32K Microbuller
32K Microbuller
Snapshot Option
VOTRAX
Type of Talk Speech
SCOTT INSTRUMENTS
Voice Recognif n VET80
CORVUS
5 Mb Hard Disk
10 Mb Hard Disk
20 Mb Hard Disk
QBANCE MICRO

ORANGE MICRO
The Grappler I/O (Plus)

Apple Cat II 389.00
HAYES MICROCOMPUTER
Hayes Chronograph 249.00
Micromodem II 349.00
Smartmodem

Smartmodem
MOUNTAIN COMPUTER
CPS Multifunction
RAM Plus
Expansion Chassis
Music System
100,000 Day Clock
The Clock

Supertalker Introl X-10 Controller ROM Plus Keyboard Filter ROM Copy ROM ROM Writer

M&R ENTERPRISES

Power Supply

Sup'rMod II RE Modulator

Apple Fan

Supirterm 80x24 Car SupirSwitcher 6 Amp

The CP/M Plus Z80 and Smarterm 80x24 Card The Synergizer Package

SATURN SYSTEMS 32K RAM Card 64K RAM Card

128K RAM Card NOVATION

The Clock A/D plus D/A

MICROSOFT

SSM

\$999.00 1049.00

1499.00

.ACP \$449.00

389.00 CALL 21.95

375.00 199.00 174.95 149.95 695.00

ACP \$249.00

579.00

179.00 165.00

124.95 44.50 25.95

199.00

117.00

269.00

149.00 25.00

399.00 699.00

499.00 269.00

279.00 129.00 30.00 69.00

220.00

253.00 59.00

339.00

675.00

129.95

189.00

355.00 505.00

329.00

229.00 289.00 229.00

169.00 139.00

335.00

325.00 249.00

175.00 129.00 44.00 44.00 159.00

279.00

239.00

49.00 43.00



| Controller               | 600.00           | APPLE HA                  | RDWAR   | Ξ   |
|--------------------------|------------------|---------------------------|---------|-----|
| only 🚄                   |                  | "Apple Products Ava       |         | re  |
| \$"J6                    | 000              | Vista Apple III Timecard  | 195.00  | -   |
| 400                      | 200              | ProFile Hard Disk Drive   | 3499.00 | 5   |
|                          |                  | Apple III w/256K          | 4295.00 | 2   |
| Totally compatible       | to Apple Drives. | Apple III w/128K          | 3495.00 | 2   |
| Tatallingananatilala     | La Annia Drivas  | Z80 Card, Vision80        | 2519.00 | - 1 |
| Constitution of the last | DI2K DI1AG       | Apple II System Special w | /64K,   |     |
|                          | Disk Drive       | Apple II Plus w/64K       | 1729.00 | - 1 |

Controller . . . . . . . . \$99.00 Just plug in and run.

**NOW AVAILABLE** 

FREE **IBM PC Catalog** 

# Computer Company



# Add 8" Disk Drives To Your Apple II

Up To 2.4 Megabyte! Now "TRIMLINE V1100" with

Tandon Thinline DS DD Drives.

| Tandon Dual DS DD | \$1895.00 |
|-------------------|-----------|
| Qume Dual DS DD   | 1699.00   |
| Shugart Dual 801R | 1295.00   |

# Vista Quartet



apple computer

Authorized Dealer

# ON DISK FOR APPLE SAVE UP TO 40% OFF

| Visicalc 3.3                                                     |
|------------------------------------------------------------------|
| Supercalc         189           Visi Trend/Visi Plot         235 |
| Visi Trend/Visi Plot235                                          |
|                                                                  |
|                                                                  |
| Visi Dex                                                         |
| Visi File                                                        |
| Visi Plot159                                                     |
| Desk top Plan II/III                                             |
| Visi Schedule                                                    |
| Visi Term79                                                      |
| Zork34                                                           |
| Versa Form                                                       |
| dBase II Ashton-Tate439                                          |
| Wordstar                                                         |
| Mail Merge180                                                    |
| Spell Star                                                       |
| Data Star189                                                     |
| Calc Star99                                                      |
| Super Sort                                                       |
| Spellguard                                                       |
| DB Master(new)                                                   |
| DB Utility                                                       |
| PFS II/I/185                                                     |
| Report II/III                                                    |
| Locksmith 4.074                                                  |
| Accounting Plus                                                  |
| Microcourier                                                     |
| Microtelegraph                                                   |
| Magic Window II                                                  |
|                                                                  |

# PACKARD CALCULATORS

| HP41CV | w/2.2K Memory 256       |
|--------|-------------------------|
| HP41   | Memory Module 26        |
| HP41   | Quad RAM 83             |
| HP41   | Card Reader 169         |
| HP41   | Printer292              |
| HP41   | Optical Wand 99         |
| HP-IL  | InterfaceLoop119        |
| HP11C  | Advanced Scientific 119 |
| HP12C  | Financial129            |
| HP34C  | Prog. Scientific112     |
| HP38C  |                         |
|        |                         |

NEW LOW PRICE

\$59<sup>95</sup> Also from COEX **NEW** EPSON Parallel Interface for Apple.

16K RAM CARD

Z80 Softcard™ ... PASCAL CP/M™

Full 1 year Warranty. Top Quality by COEX

With cable..... \$39.95

TERMS: MO Cashier's Check, Bank Wire, Personal checks allow 2 weeks lor processing, Include Drivers License and credit card # 5 Vesa. AMEX, CB add 3% service charge, Add 3% shipping & handling or \$2.50, whichever is greater. Add 10% for foreign orders or US ParcelPost include reliephone number, NOCODS Prices subject to change without notice. Some items subject to prior sale. We reserve the right rossubstitute manufacturer. Fletail prices may vary.

# 4164 64K DYNAMIC 200 NS

**ALL MERCHANDISE 100% GUARANTEED!** 

# TMM2016 2KX8 STATIC \$41

**CALL US FOR VOLUME QUOTES** 

6800

5 9.9

4.9

7.9

13.9

19.9

2.9

4.9

14.9

12.9

34.9

25.9

14.9

12.2

5.7

9.9

6.9

2.2

24.9

19.9

10.9

222

29.9

29.9

7.9 12 9

35.9

12.9

5.9

6.9

8.9

9.9

43

8.7

11.2

22.5

11.8

9.9

11.7

124

28.5

12.9

3 MHZ

1MHZ

68000

6800

6802

6808

6809E

6809 6810

6820

6821 6828

6840

6843

6844

6845

6847

6850 6852

6860

6862 6875

6880

6883

68047 68488

68B00

68B02

68B09E

68B09

68R10

68B21 68B45

68B50

6502

6504

6505

6507

6520

6522

6532

6545

6551

6502A

6522A

6532A

6545A

6551A

68B00 = 2 MHZ

6500 1 MHZ

6800

| S           | TAT      | IC RAMS              |        |
|-------------|----------|----------------------|--------|
| 2101        | 256 x 4  | (450ns)              | 1.9    |
| 5101        | 256 x 4  | (450ns) (cmos)       | 3.9    |
| 2102-1      | 1024 x 1 | (450ns)              | .89    |
| 2102L-4     | 1024 x 1 | (450ns) (LP)         | 1.29   |
| 2102L-2     | 1024 x 1 | (250ns) (LP)         | 1.6    |
| 2111        | 256 x 4  | (450ns)              | 2.9    |
| 2112        | 256 x 4  | (450ns)              | 2.9    |
| 2114        |          | (450ns)              | 8/14.9 |
| 2114L-4     | 1024 x 4 | (450ns) (LP)         | 8/15.2 |
| 2114L-3     |          | (300ns) (LP)         | 8/15.4 |
| 2114L-2     | 1024 x 4 | (200ns) (LP)         | 8/15.9 |
| 2147        | 4096 x 1 | (55ns)               | 4.9    |
| TMS4044-4   |          |                      | 3.49   |
| TMS4044-3   |          | (300ns)              | 3.9    |
| TMS4044-2   | 4096 x 1 | (200ns)              | 4.4    |
| MK4118      |          | (250ns)              | 9.9    |
| TMM2016-200 | 2048 x 8 | (200ns)              | 4.1    |
| TMM2016-150 |          |                      | 4.9    |
| TMM2016-100 |          |                      | 6.1    |
| HM6116-4    |          | (200ns) (cmos)       | 4.9    |
| HM6116-3    |          | (150ns) (cmos)       | 5.9    |
| HM6116-2    |          | (120ns) (cmos)       | 8.9    |
| HM6116LP-4  |          | (200ns) (cmos)(LP)   | 6.9    |
|             | 2048 x 8 | (150ns) (cmos)(LP)   | 8.9    |
| HM6116LP-2  |          | (120ns) (cmos)(LP)   | 10.9   |
| Z-6132      | 4096 x 8 | (300ns) (Qstat)      | 34.9   |
| LP = Lo     | w Power  | Qstat = Quasi-Statio | :      |

| Г       | VNIAN     | IIC RAN      | 10      |
|---------|-----------|--------------|---------|
|         |           |              |         |
| MS4027  | 4096 x 1  | (250ns)      | 1.99    |
| JPD411  | 4096 x 1  | (300ns)      | 3.00    |
| 1M5280  | 4096 x 1  | (300ns)      | 3.00    |
| 1K4108  | 8192 x 1  | (200ns)      | 1.95    |
| M5298   | 8192 x 1  | (250ns)      | 1.85    |
| 116-300 | 16384 x 1 | (300ns)      | 8/11.75 |
| 116-250 | 16384 x 1 | (250ns)      | 8/11.95 |
| 116-200 | 16384 x 1 | (200ns)      | 8/13.95 |
| 116-150 | 16384 x 1 | (150ns)      | 8/15.95 |
| 116-120 | 16384 x 1 | (120ns)      | 8/29.95 |
| 118     | 16384 x 1 | (150ns) (5v) | 4.95    |
| 164-200 | 65536 x 1 | (200ns) (5v) | 6.25    |
| 164-150 | 65536 x 1 | (150ns) (5v) | 7.25    |

5V = single 5 volt supply

|          | <b>EPROMS</b>                |        |
|----------|------------------------------|--------|
| 1702     | 256 x 8 (1us)                | 4.50   |
| 2708     | 1024 x 8 (450ns)             | 3.95   |
| 2758     | 1024 x 8 (450ns)(5v)         | 5.95   |
| 2716     | 2048 x 8 (450ns)(5v)         | 3.95   |
| 2716-1   | 2048 x 8 (350ns)(5v)         | 6.25   |
| TMS2516  | 2048 x 8 (450ns)(5v)         | 5.50   |
| TMS2716  | 2048 x 8 (450ns)             | 7.95   |
| TMS2532  | 4096 x 8 (450ns)(5v)         | 7.95   |
| 2732     | 4096 x 8 (450ns)(5v)         | 4.95   |
| 2732-250 | 4096 x 8 (250ns)(5v)         | 12.95  |
| 2732-200 | 4096 x 8 (200ns)(5v)         | 16.95  |
| 2764     | 8192 x 8 (450ns)(5v)         | 16.95  |
| 2764-250 | 8192 x 8 (250ns)(5v)         | .18.95 |
| 2764-200 | 8192 x 8 (200ns)(5v)         | 24.95  |
| TMS2564  | 8192 x 8 (450ns)(5v)         | 24.95  |
| MC68764  | 8192 x 8 (450ns)(5v)(24 pin) | 39.95  |
|          | 5v = Single 5 Volt Supply    |        |

| EPROM ERASERS                          |   |    |        |        |  |  |
|----------------------------------------|---|----|--------|--------|--|--|
| Capacity Intensity Timer Chip (uW/Cm²) |   |    |        |        |  |  |
| PE-14                                  |   | 6  | 5,200  | 83.00  |  |  |
| PE-14T                                 | X | 6  | 5,200  | 119.00 |  |  |
| PE-24T                                 | X | 9  | 6,700  | 175.00 |  |  |
| PL-265T                                | X | 20 | 6,700  | 255.00 |  |  |
| PR-125T                                | X | 16 | 15,000 | 349.00 |  |  |
| DD-320                                 | Y | 32 | 15,000 | 595 00 |  |  |

|    | DISC                                       |                |
|----|--------------------------------------------|----------------|
|    | CONTROLL                                   | FRS            |
| ١  | 1771                                       | 16.95          |
|    | 1791                                       | 29.95          |
| 1  | 1793<br>1795                               | 38.95<br>54.95 |
| 1  | 1797                                       | 54.95          |
|    | 6843                                       | 34.95          |
|    | 8272<br>UPD765                             | 39.95<br>39.95 |
| 1  | 1691                                       | 18.95          |
| ı  | 2143                                       | 18.95          |
|    | INTERFA                                    |                |
|    | 8T26<br>8T28                               | 1.69<br>2.49   |
|    | 8T95                                       | .99            |
| ď  | 8T96<br>8T97<br>8T98                       | .99            |
| ő, | 8197<br>8T98                               | .99<br>.99     |
|    | DM8131                                     | 2.95           |
|    | DP8304                                     | 2.29<br>1.99   |
| •  | DS8835<br>DS8836                           | .99            |
| ı  | MISC.                                      |                |
|    | 3242                                       | 7.95           |
| 1  | 3341<br>MC3470                             | 4.95<br>4.95   |
| 1  | MC3470<br>MC3480                           | 9.00           |
|    | 11C90<br>95H90                             | 13.95          |
|    | 2513-001 UP                                | 7.95<br>9.95   |
|    | 2513-002 LOW                               | 9.95           |
| 1  | SOUND CH                                   | IIPS           |
|    | 76477<br>76489                             | 3.95           |
| 1  | AY3-8910                                   | 8.95<br>12.95  |
| ı  | MC3340                                     | 1.49           |
|    | CRT                                        |                |
|    | CONTROLL                                   | ERS            |
| ı  | 6845<br>68B45                              | 14.95<br>35.95 |
|    | HD46505SP                                  | 15.95          |
|    | 6847<br>MC1372                             | 12.25<br>6.95  |
|    | 68047                                      | 24.95          |
|    | 8275                                       | 29.95          |
|    | 7220<br>CRT5027                            | 99.95<br>39.95 |
|    | CRT5037<br>TMS9918A                        | 49.95          |
|    | TMS9918A                                   | 39.95          |
|    | DP8350<br>BIT-RAT                          | 49.95          |
|    | GENERAT                                    |                |
|    | MC14411                                    | 11.95          |
|    | BR1941                                     | 11.95          |
|    | 4702<br>COM5016                            | 12.95<br>16.95 |
|    | COM8116                                    | 10.95          |
|    | MM5307                                     | 10.95          |
|    | UARTS                                      |                |
|    | AY3-1014<br>AY5-1013<br>AY3-1015<br>PT1472 | 6.95<br>3.95   |
|    | AY3-1015                                   | 6.95           |
|    | PT1472                                     | 9.95<br>3.95   |
|    | TR1602<br>2350                             | 9.95           |
|    | 2651                                       | 9.95<br>8.95   |
|    | TMS6011<br>IM6402                          | 5.95<br>7.95   |
|    | IM6403                                     | 8.95           |
|    | INS8250                                    | 14.95          |
|    | KEYBOAF                                    | RD             |

| TMS6011  | 5.95  |
|----------|-------|
| IM6402   | 7.95  |
| IM6403   | 8.95  |
| INS8250  | 14.95 |
| KEYBO    | ARD   |
| CHIE     | S     |
| AY5-2376 | 11.95 |
| AY5-3600 | 11.95 |
| CLO      | CK    |
| CIRCU    | ITS   |
| MM5314   | 4.95  |
| MM5369   | 3.95  |
| MM5375   | 4.95  |
| MM58167  | 8.95  |
| MM58174  | 11.95 |
| MSM5832  | 6.95  |
|          |       |

|     | Z-80<br>2.5 Mh                                                                                                                                                                                     | )                                                                                 |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|     | Z80-CPU                                                                                                                                                                                            | 3.95                                                                              |
| 1   | Z80-CTC<br>Z80-DART<br>Z80-DMA                                                                                                                                                                     | 5.95<br>15.25<br>17.50                                                            |
| No. | Z80-PIO<br>Z80-SIO/0                                                                                                                                                                               | 5.75<br>18.50                                                                     |
|     | Z80-SIO/1<br>Z80-SIO/2                                                                                                                                                                             | 18.50<br>18.50                                                                    |
| -   | Z80-SIO/9                                                                                                                                                                                          | 16.95                                                                             |
| 1   | 4.0 Mh<br>Z80A-CPU                                                                                                                                                                                 | 6.00                                                                              |
| 1   | Z80A-CTC<br>Z80A-DART                                                                                                                                                                              | 8.65<br>18.75                                                                     |
|     | Z80A-DMA<br>Z80A-PIO                                                                                                                                                                               | 27.50<br>6.00                                                                     |
|     | Z80A-SIO/0<br>Z80A-SIO/1                                                                                                                                                                           | 22.50<br>22.50                                                                    |
|     | Z80A-SIO/2<br>Z80A-SIO/9                                                                                                                                                                           | 22.50<br>19.95                                                                    |
|     | 6.0 Mh                                                                                                                                                                                             |                                                                                   |
|     | Z80B-CPU<br>Z80B-CTC                                                                                                                                                                               | 17.95<br>15.50                                                                    |
|     | Z80B-PIO                                                                                                                                                                                           | 15.50                                                                             |
| 1   | ZILO0<br>Z6132                                                                                                                                                                                     | 34.95                                                                             |
|     | Z8671                                                                                                                                                                                              | 39.95                                                                             |
|     |                                                                                                                                                                                                    |                                                                                   |
|     | CRYST                                                                                                                                                                                              |                                                                                   |
|     | 32.768 khz<br>1.0 mhz                                                                                                                                                                              | 1.95<br>4.95                                                                      |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0                                                                                                                                                             | 1.95<br>4.95<br>4.95<br>3.95                                                      |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576                                                                                                                                       | 1.95<br>4.95<br>4.95                                                              |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535                                                                                                                 | 1.95<br>4.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95                      |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0<br>5.0                                                                                                   | 1.95<br>4.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95      |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0                                                                                                          | 1.95<br>4.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95              |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0<br>5.0<br>5.0688                                                                                         | 1.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3         |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0<br>5.0<br>5.0688<br>5.185<br>5.7143                                                                      | 1.95<br>4.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3 |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0<br>5.0<br>5.0688<br>5.185<br>5.7143<br>6.0<br>6.144<br>6.5536<br>8.0                                     | 1.95<br>4.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3 |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0<br>5.0<br>5.0688<br>5.185<br>5.7143<br>6.0<br>6.144<br>6.5536                                            | 1.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                                    |
|     | 32.768 khz<br>1.0 mhz<br>1.8432<br>2.0<br>2.097152<br>2.4576<br>3.2768<br>3.579535<br>4.0<br>5.0<br>5.0688<br>5.185<br>5.7143<br>6.0<br>6.144<br>6.5536<br>8.0<br>10.738635<br>14.31818<br>15.0    | 1.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                                    |
|     | 32.768 khz 1.0 mhz 1.8432 2.0 2.097152 2.4576 3.2768 3.579535 4.0 5.0688 5.185 5.7143 6.0 6.144 6.5536 8.0 10.738635 14.31818 15.0 16.0 17.430 18.0                                                | 1.95 4.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                               |
|     | 32.768 khz 1.0 mhz 1.8432 2.0 2.097152 2.4576 3.2768 3.579535 4.0 5.0 5.0688 5.185 5.77143 6.0 6.144 6.5536 8.0 10.738635 14.31818 15.0 16.0 17.430                                                | 1.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                                    |
|     | 32.768 khz 1.0 mhz 1.8432 2.0 2.097152 2.4576 3.2768 3.579535 4.0 5.0688 5.185 5.7143 6.0 6.144 6.5536 8.0 10.738635 14.31818 15.0 16.0 17.430 18.0 18.432 20.0                                    | 1.95 4.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                               |
|     | 32.768 khz 1.0 mhz 1.8432 2.0 2.097152 2.4576 3.2768 3.579535 4.0 5.0688 5.185 5.77143 6.0 6.144 6.5536 8.0 10.738635 14.31818 15.0 16.0 18.432 20.0 22.1184 32.0                                  | 1.95 4.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                               |
|     | 32.768 khz 1.0 mhz 1.8432 2.0 2.097152 2.4576 3.2768 3.579535 4.0 5.0 5.0688 5.185 5.7143 6.0 6.144 6.55536 8.0 10.738635 14.31818 15.0 16.0 17.430 18.432 20.0 22.1184 32.0  DATA ACQUISITADC0800 | 1.95 4.95 4.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3                               |
|     | 32.768 khz 1.0 mhz 1.8432 2.0 2.097152 2.4576 3.2768 3.579535 4.0 5.0688 5.185 5.7143 6.0 6.144 6.5536 8.0 10.738635 14.31818 15.0 16.0 18.432 20.0 22.1184 32.0  DATA ACQUISIT                    | 1.95<br>4.95<br>4.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3.95<br>3 |

| 32.0     | 3.95  |
|----------|-------|
| DATA     | 1     |
| ACQUISI7 | TION  |
| ADC0800  | 15.55 |
| ADC0804  | 3.49  |
| ADC0809  | 4.49  |
| ADC0817  | 9.95  |
| DAC0800  | 4.95  |
| DAC0806  | 1.95  |
| DAC0808  | 2.95  |
| DAC1020  | 8.25  |
| DAC1022  | 5.95  |
| MC1408L6 | 1.95  |
| MC1408L8 | 2.95  |
|          |       |

| 5.95<br>6.95<br>17.95<br>24.95<br>3.95<br>5.95<br>11.95<br>29.95<br>CALL<br>39.95<br>89.95 |
|--------------------------------------------------------------------------------------------|
| 17.95<br>24.95<br>3.95<br>5.95<br>11.95<br>29.95<br>CALL<br>39.95                          |
| 24.95<br>3.95<br>5.95<br>11.95<br>29.95<br>CALL<br>39.95                                   |
| 3.95<br>5.95<br>11.95<br>29.95<br>CALL<br>39.95                                            |
| 5.95<br>11.95<br>29.95<br>CALL<br>39.95                                                    |
| 11.95<br>29.95<br>CALL<br>39.95                                                            |
| 29.95<br>CALL<br>39.95                                                                     |
| 39.95                                                                                      |
| 39.95                                                                                      |
| -                                                                                          |
| 89.95                                                                                      |
|                                                                                            |
| 7.95                                                                                       |
| 8.95                                                                                       |
| 29.95                                                                                      |
| 39.95                                                                                      |
| 39.95                                                                                      |
| 29.95                                                                                      |
| 32.00                                                                                      |
|                                                                                            |
|                                                                                            |

29.95

8202

| FUN          | CTION        |
|--------------|--------------|
| 8289         | 49.95        |
| 8288         | 25.00        |
| 8287         | 6.50         |
| 8286         | 6.50         |
| 8284         | 5.50         |
| 8283         | 6.50         |
| 8282         | 6.50         |
| 8279-5       | 10.00        |
| 8279         | 8.95         |
| 8275         | 29.95        |
| 8272         | 39.95        |
| 8271         | 39.95        |
| 8259-5       | 7.50         |
| 8259         | 6.90         |
| 8257-5       | 8.95         |
| 8257         | 7.95         |
| 8255-5       | 5.25         |
| 8255         | 4.49         |
| 8253-5       | 7.95         |
| 8253         | 6.95         |
| 8251         | 4.49         |
| 8250         | 10.95        |
| 8243         | 4.45         |
| 8238         | 4.49         |
| 8237         | 19.95        |
| 8228         | 3.49         |
| 8226         | 1.80         |
| 8224         | 2.25         |
| 8214         | 1.75         |
| 8212         | 3.85         |
| 8205<br>8212 | 3.50<br>1.80 |
| 8203         | 39.95        |
|              |              |

| GENERA   | TORS  |
|----------|-------|
| MC4024   | 3.95  |
| LM566    | 1.49  |
| XR2206   | 3.75  |
| 8038     | 3.95  |
|          |       |
| INTER    | RSIL  |
| ICL7103  | 9.50  |
| ICL7106  | 9.95  |
| ICL7107  | 12.95 |
| ICI 7660 | 2 05  |

ICL8038

ICM7207A

ICM7208

|    | 0502B   | 14.  |
|----|---------|------|
|    |         |      |
| 1  | EXA     | ۱R   |
|    | XR 2206 | 3    |
| ı  | XR 2207 | 3    |
|    | XR 2208 | 3    |
| d  | XR 2211 | 5    |
|    | XR 2240 | 3    |
|    |         |      |
|    | -       | -    |
| 18 | 9000 SE | ERIE |
|    | 9316    | 1    |
|    | 9334    | 2    |
|    | 9368    | 3    |
|    | 9401    | 9    |
|    | 9601    |      |
|    | 9602    | 1    |

96S02



JDR MICRODEVICES, INC.

1224 S. Bascom Avenue San Jose, CA 95128 800-538-5000 • 800-662-6279 (CA) (408) 995-5430 • Telex 171-110

© 1982 JDR MICRODEVICES, INC.

NEW HOURS M-W-F, 9-5 VISIT OUR RETAIL STORE T-Th., 9-9

3.95 1 49 3.75 3.95

9.50 9.95 12.95 2.95

3.95

5.59

15.95

PLEASE USE YOUR CUSTOMER NUMBER WHEN ORDERING

TERMS: For shipping include \$2 for UPS Ground or \$3 for UPS Blu Label Air. Items over 5 pounds require additional shipping charge Foreign orders, include sufficient amount for shipping. There is a \$ Foreign Green, include sumcent amount for simpling. There is a minimum order. Bay Area and Los Angeles Counties add 6½% ST Tax. Other California residents add 6½% Sales Tax. We reserve right to substitute manufacturer. Not responsible for typograph errors. Prices are subject to change without notice. We will match beat any competitor's price provided it is not below our cost.

# 2716 16K EPROMS \$395 EACH

2732 32K EPROMS \$495 EACH **CALL US FOR VOLUME QUOTES** 

# **ALL MERCHANDISE 100% GUARANTEED!**

| 74LS00           |            |                    |             |                    |            |                    |       |  |
|------------------|------------|--------------------|-------------|--------------------|------------|--------------------|-------|--|
| 74LS00           | .24        | 74LS86             | .39         | 74LS169            | 1.75       | 74LS323            | 3.50  |  |
| 74LS01           | .25        | 74LS90             | .55         | 74LS170            | 1.49       | 74LS324            | 1.75  |  |
| 74LS02           | .25        | 74LS91             | .89         | 74LS173            | .69        | 74LS352            | 1.29  |  |
| 74LS03           | .25        | 74LS92             | .55         | 74LS174            | .55        | 74LS353            | 1.29  |  |
| 74LS04           | .24        | 74LS93             | .55         | 74LS175            | .55        | 74LS363            | 1.35  |  |
| 74LS05           | .25        | 74LS95             | .75         | 74LS181            | 2.15       | 74LS364            | 1.95  |  |
| 74LS08           | .28        | 74LS96             | .89         | 74LS189            | 8.95       | 74LS365            | .49   |  |
| 74LS09           | .29        | 74LS107            | .39         | 74LS190            | .89        | 74LS366            | .49   |  |
| 74LS10           | .25        | 74LS109            | .39         | 74LS191            | .89        | 74LS367            | .45   |  |
| 74LS11           | .35        | 74LS112            | .39         | 74LS192            | .79        | 74LS368            | .45   |  |
| 74LS12           | .35        | 74LS 113           | .39         | 74LS193            | .79        | 74LS373            | .99   |  |
| 74LS13           | .45        | 74LS114            | .39         | 74LS194            | .69        | 74LS374            | .99   |  |
| 74LS14           | .59        | 74LS122            | .45         | 74LS195            | .69        | 74LS377            | 1.39  |  |
| 74LS15           | .35        | 74LS123            | .79         | 74LS196            | .79        | 74LS378            | 1.18  |  |
| 74LS20           | .25        | 74LS124            | 2.90        | 74LS197            | .79        | 74LS379            | 1.35  |  |
| 74LS21           | .29        | 74LS125            | .49         | 74LS221            | .89        | 74LS385            | 1.90  |  |
| 74LS22           | .25        | 74LS126            | .49         | 74LS240            | .95        | 74LS386            | .45   |  |
| 74LS26           | .29        | 74LS132            | .59         | 74LS241            | .99        | 74LS390            | 1.19  |  |
| 74LS27           | .29        | 74LS133            | .59         | 74LS242            | .99        | 74LS393            | 1.19  |  |
| 74LS28           | .35        | 74LS136            | .39         | 74LS243            | .99        | 74LS395            | 1.19  |  |
| 74LS30           | .25        | 74LS137            | .99         | 74LS244            | .99        | 74LS399            | 1.49  |  |
| 74LS32           | .29        | 74LS138            | .55         | 74LS245            | 1.49       | 74LS424            | 2.95  |  |
| 74LS33           | .55        | 74LS139            | .55         | 74LS247            | .75        | 74LS447            | .37   |  |
| 74LS37           | .35        | 74LS145            | 1.20        | 74LS248            | .99        | 74LS490            | 1.95  |  |
| 74LS38           | .35        | 74LS147            | 2.49        | 74LS249            | .99        | 74LS624<br>74LS668 | 3.99  |  |
| 74LS40           | .25        | 74LS148            | 1.35        | 74LS251            | .59        |                    | 1.69  |  |
| 74LS42           | .49        | 74LS151            | .55         | 74LS253            | .59        | 74LS669            | 1.89  |  |
| 74LS47           | .75        | 74LS153            | .55         | 74LS257            | .59<br>.59 | 74LS670<br>74LS674 | 9.65  |  |
| 74LS48           | .75<br>.75 | 74LS154            | 1.90<br>.69 | 74LS258<br>74LS259 | 2.75       | 74LS674<br>74LS682 | 3.20  |  |
| 74LS49           | .75        | 74LS155<br>74LS156 | .69         | 74LS259<br>74LS260 | .59        | 74LS683            | 3.20  |  |
| 74LS51<br>74LS54 | .25        | 74LS156<br>74LS157 | .65         | 74LS260<br>74LS266 | .55        | 74LS684            | 3.20  |  |
| 74LS54<br>74LS55 | .29        | 74LS157            | .59         | 74LS200<br>74LS273 | 1.49       | 74LS685            | 3.20  |  |
| 74LS55<br>74LS63 | 1.25       | 74LS158            | .69         | 74LS273            | 3.35       | 74LS688            | 2.40  |  |
| 74LS03           | .39        | 74LS160<br>74LS161 | .65         | 74LS275            | .49        | 74LS689            | 3.20  |  |
| 74LS73           | .35        | 74LS161            | .69         | 74LS280            | 1.98       | 74LS783            | 24.95 |  |
| 74LS74<br>74LS75 | .35        | 74LS162<br>74LS163 | .65         | 74LS280<br>74LS283 | .69        | 81LS95             | 1.49  |  |
| 74LS75           | .39        | 74LS163            | .69         | 74LS283            | .89        | 81LS96             | 1.49  |  |
| 74LS76           | .49        | 74LS164<br>74LS165 | .95         | 74LS290            | .89        | 81LS97             | 1.49  |  |
| 74LS78           | .60        | 74LS165            | 1.95        | 74LS293            | .89        | 81LS98             | 1.49  |  |
| 74LS85           | .69        | 74LS168            | 1.75        | 74LS298            | .89        | 25LS2521           | 2.80  |  |
| 146303           | .09        | 1465100            | 1.75        | 74LS299            | 1.75       | 25LS2521           | 4.25  |  |
|                  |            |                    |             | 1463233            | 1.73       | 23232303           | 7.23  |  |

| January Marie          |              | 100   |
|------------------------|--------------|-------|
| IC SO                  | CKE          | TS \  |
|                        | 1-99         |       |
| 8 pin ST               | .13          | .11   |
| 14 pin ST              | .15          |       |
| 16 pin ST              | .17          | .13   |
| 18 pin ST              | .20          | .18   |
| 20 pin ST              | .29          | .27   |
| 22 pin ST              | .30          | .27   |
| 24 pin ST              | .30          | .27   |
| 28 pin ST              | .40          | .32   |
| 40 pin ST              |              | .39   |
| 64 pin ST              | 4.25         |       |
| ST = SOL               |              |       |
| 8 pin WW               | .59          | .49   |
| 14 pin WW              | .69          | .52   |
| 16 pin WW              | .69          | .58   |
| 18 pin WW              |              | .90   |
| 20 pin WW              | 1.09         | .98   |
| 22 pin WW              | 1.39<br>1.49 | 1.28  |
| 24 pin WW              | 1.49         | 1.35  |
| 28 pin WW<br>40 pin WW | 1.09         | 1.80  |
| WW = WI                |              |       |
| 16 pin ZIF             |              | call  |
| 24 pin ZIF             |              |       |
| 28 pin ZIF             |              |       |
| ZIF = T                |              |       |
| (Zero Inse             |              |       |
| (Zero inse             | THORF        | orce) |

7400 7401

7447 7448

7450

7473 7474

7475 7476

7480 7481

7482 7483

7485 7486 7489

7490

7491 7492 7493

74122

.19 .19 .19

.19 .25 .29 .29 .24 .19 .25 .30 .35 .49 .25 .19 .35

.59 1.10

.35 .40 .50 .35 .65 .70 2.75 1.75 .45 .45 .55

| CONNECTO     | RS   |
|--------------|------|
| RS232 MALE   | 2.95 |
| RS232 FEMALE | 3.50 |
| RS232 FEMALE |      |
| RIGHT ANGLE  | 5.25 |
| RS232 HOOD   | 1.25 |
| S-100 ST     | 3.95 |
| S-100 WW     | 4.95 |
| A            | 4    |

| DIP        |     |
|------------|-----|
| SWITCH     | ES  |
| 4 POSITION | .85 |
| 5 POSITION | .90 |
| 6 POSITION | .90 |
| 7 POSITION | .95 |
| 8 POSITION | .95 |

# Prices Slashed!

| <b>74S00</b>    |             |                  |              |  |  |  |  |
|-----------------|-------------|------------------|--------------|--|--|--|--|
| 74S00           | .32         | 74S163           | 1.95         |  |  |  |  |
| 74S02           | .35         | 74S168           | 3.95         |  |  |  |  |
| 74S03           | .35         | 74S169           | 3.95         |  |  |  |  |
| 74S04           | .35         | 745174           | .95          |  |  |  |  |
| 74S05           | .35         | 74S175           | .95          |  |  |  |  |
| 74S08           | .35         | 74S181           | 3.95         |  |  |  |  |
| 74S09           | .40         | 74S182           | 2.95         |  |  |  |  |
| 74S10           | .35         | 745188           | 1.95         |  |  |  |  |
| 74S11           | .35         | 74S189           | 6.95         |  |  |  |  |
| 74S15           | .35         | 74S194           | 1.49         |  |  |  |  |
| 74S20           | .35         | 74S195           | 1.49         |  |  |  |  |
| 74522           | .35         | 74S196           | 1.49         |  |  |  |  |
| 74530           | .35         | 745197           | 1.49         |  |  |  |  |
| 74532           | .40         | 74S201           | 6.95         |  |  |  |  |
| 74537           | .88         | 74S225           | 7.95         |  |  |  |  |
| 74538           | .85         | 74S240           | 2.20         |  |  |  |  |
| 74540           | .35         | 745241           | 2.20         |  |  |  |  |
| 74S51           | .35         | 745244           | 2.20         |  |  |  |  |
| 74564           | .40         | 74S251           | .95          |  |  |  |  |
| 74S65           | .40         | 74S253           | .95          |  |  |  |  |
| 74S74<br>74S85  | .50<br>1.99 | 74S257           | .95          |  |  |  |  |
| 74585<br>74586  | .50         | 74S258           | .95          |  |  |  |  |
| 74586<br>745112 | .50         | 745260           | .79<br>19.95 |  |  |  |  |
| 745112          | .50         | 74S274<br>74S275 | 19.95        |  |  |  |  |
| 745113          | .55         | 745275<br>74S280 | 1.95         |  |  |  |  |
| 745114          | 2.75        | 745280<br>745287 | 1.90         |  |  |  |  |
| 745124          | 1.24        | 74S288           | 1.90         |  |  |  |  |
| 745132          | .45         | 74S289           | 6.89         |  |  |  |  |
| 745134          | .50         | 74S301           | 6.95         |  |  |  |  |
| 74S135          | .89         | 745373           | 2.45         |  |  |  |  |
| 74S138          | .85         | 745374           | 2.45         |  |  |  |  |
| 745139          | .85         | 745381           | 7.95         |  |  |  |  |
| 745140          | .55         | 745387           | 1.95         |  |  |  |  |
| 74S151          | .95         | 745412           | 2.98         |  |  |  |  |
| 74S153          | .95         | 745471           | 4.95         |  |  |  |  |
| 74S157          | .95         | 745472           | 4.95         |  |  |  |  |
| 74S158          | .95         | 745474           | 4.95         |  |  |  |  |
| 745161          | 1.95        | 74S482           | 15.25        |  |  |  |  |
|                 |             |                  |              |  |  |  |  |





# ORDER TOLL FREE 800-538-5000 800-662-6279 (CALIFORNIA RESIDENTS)

IF YOU CAN FIND A PRICE LOWER ELSEWHERE, LET US KNOW AND WE'LL MEET OR BEAT THEIR PRICE! (SEE TERMS BELOW)

- ★ Computer managed inventory virtually no back orders!
- \* Very competitive prices!
- \* Friendly staff!
- \* Fast service most orders shipped within 24 hours!

# LED DISPLAYS

| HP 5082-7760  | .6"   | CC | 1.29  |
|---------------|-------|----|-------|
| MAN 72        | .3"   | CA | .99   |
| MAN 74        | .3"   | CC | .99   |
| FND-357 (359) | .375" | CC | 1.25  |
| FND-500 (503) | .5"   | CC | 1.49  |
| FND-507 (510) | .5"   | CA | 1.49  |
|               |       |    | 0.000 |

### LED LAMPS Jumbo Red .10 .09 Jumbo

# 100-up Green .18 .15 Jumbo

| IN4004                             | RECTIF                     | IER          |                 |     |
|------------------------------------|----------------------------|--------------|-----------------|-----|
| 2N3904<br>2N3906<br>IN4148 (IN914) | NPN SV<br>NPN SV<br>SWITCI | VITCH        | TO-92           |     |
| 3055T                              | NPN PC                     |              | TO-220<br>TO-92 |     |
| 2N3055                             | NPN PC                     |              | TO-3            |     |
| 2N2907                             | PNP SV                     |              | TO-18           |     |
| 2N2222                             | NPN SV                     |              | TO-18           |     |
| PN2222<br>PN2907                   | NPN SV                     |              | TO-92<br>TO-92  |     |
|                                    | _                          | _            | ORS             | DI  |
|                                    | 1.7.2.7                    |              | 4.5             |     |
|                                    | 74490                      | 2.55         | 4526            | 1.2 |
| 74128 .55                          | 74426                      | .85          | 4520<br>4522    | 1.2 |
| 74125 .45                          | 74393<br>74425             | 1.35<br>3.15 | 4519            | .3  |
| 74123 .49<br>74125 .45             | 74390                      | 1.75         | 4518            | 3.  |

| 74          | 100            | 1             |      |                | CM             |                  |                |
|-------------|----------------|---------------|------|----------------|----------------|------------------|----------------|
| .19<br>.19  | 74132          | .45           | . 9  | 4000<br>4001   | .29<br>.25     | 4527<br>4528     | 1.95<br>1.19   |
| .19         | 74136<br>74141 | .50<br>.65    | -    | 4002           | .25            | 4531             | .95            |
| .19         | 74142          | 2.95          |      | 4006<br>4007   | .89<br>.29     | 4532<br>4538     | 1.95<br>1.95   |
| .19<br>.25  | 74143<br>74145 | 2.95<br>.60   |      | 4008           | .95            | 4539             | 1.95           |
| .29         | 74147          | 1.75          | 10   | 4009<br>4010   | .39<br>.45     | 4541<br>4543     | 2.64<br>1.19   |
| .29<br>.24  | 74148<br>74150 | 1.20<br>1.35  |      | 4011           | .25            | 4553             | 5.79           |
| .19         | 74151          | .55           |      | 4012<br>4013   | .25<br>.38     | 4555<br>4556     | .95<br>.95     |
| .19<br>.25  | 74152<br>74153 | .65<br>.55    |      | 4014           | .79            | 4581             | 1.95           |
| .30         | 74154          | 1.25          |      | 4015<br>4016   | .39<br>.39     | 4582<br>4584     | 1.95<br>.75    |
| .35<br>.49  | 74155<br>74156 | .75<br>.65    |      | 4017           | .69            | 4585             | .75            |
| .25         | 74157          | .55           |      | 4018<br>4019   | .79<br>.39     | 4702<br>74C00    | 12.95<br>.35   |
| .25<br>.19  | 74159<br>74160 | 1.65<br>.85   |      | 4020           | .75            | 74C02            | .35            |
| .35         | 74161          | .69           |      | 4021<br>4022   | .79<br>.79     | 74C04<br>74C08   | .35<br>.35     |
| .35<br>.29  | 74162<br>74163 | .85           |      | 4023           | .29            | 74C10            | .35            |
| .29         | 74163          | .69<br>.85    |      | 4024           | .65            | 74C14            | .59            |
| .29<br>.29  | 74165          | .85           |      | 4025<br>4026   | .29<br>1.65    | 74C20<br>74C30   | .35            |
| .45         | 74166<br>74167 | 1.00<br>2.95  |      | 4027           | .45            | 74C32            | .39            |
| .19<br>.29  | 74170          | 1.65          |      | 4028<br>4029   | .69<br>.79     | 74C42<br>74C48   | 1.29<br>1.99   |
| .45         | 74172<br>74173 | 5.95<br>.75   |      | 4030           | .39            | 74C73<br>74C74   | .65            |
| .29<br>.29  | 74174          | .89           |      | 4034<br>4035   | 1.95<br>.85    | 74C74            | .65<br>.80     |
| .19         | 74175<br>74176 | .89<br>.89    | 4    | 4040           | .75            | 74C83            | 1.95           |
| .49<br>.65  | 74177          | .75           | 100  | 4041<br>4042   | .75<br>.69     | 74C85<br>74C86   | 1.95<br>.39    |
| .69         | 74178<br>74179 | 1.15<br>1.75  |      | 4043           | .85            | 74C89            | 4.50           |
| .69<br>.69  | 74180          | .75           |      | 4044<br>4046   | .79<br>.85     | 74C90<br>74C93   | 1.19<br>1.75   |
| .69         | 74181<br>74182 | 2.25<br>.75   |      | 4047           | .95            | 74C95            | .99            |
| .69<br>.19  | 74184          | 2.00          | 1.5  | 4049<br>4050   | .35<br>.35     | 74C107<br>74C150 | .89<br>5.75    |
| .23         | 74185<br>74186 | 2.00<br>18.50 | 100  | 4051           | .79            | 74C151           | 2.25           |
| .23         | 74190          | 1.15          |      | 4053<br>4060   | .79<br>.89     | 74C154<br>74C157 | 3.25<br>1.75   |
| .23         | 74191<br>74192 | 1.15<br>.79   | 1    | 4066           | .39            | 74C160           | 1.19           |
| .35<br>.29  | 74193          | .79           | 87   | 4068<br>4069   | .39<br>.29     | 74C161<br>74C162 | 1.19<br>1.19   |
| .34         | 74194<br>74195 | .85<br>.85    |      | 4070           | .35            | 74C163           | 1.19           |
| .33<br>.45  | 74196          | .79           |      | 4071<br>4072   | .29<br>.29     | 74C164<br>74C165 | 1.39<br>2.00   |
| .35         | 74197<br>74198 | .75<br>1.35   |      | 4073           | .29            | 74C173           | .79            |
| .59         | 74199          | 1.35          |      | 4075<br>4076   | .29<br>.79     | 74C174<br>74C175 | 1.19<br>1.19   |
| 1.10<br>.95 | 74221<br>74246 | 1.35<br>1.35  | 1    | 4078           | .29            | 74C192           | 1.49           |
| .50         | 74247          | 1.25          |      | 4081<br>4082   | .29<br>.29     | 74C193<br>74C195 | 1.49           |
| .59<br>.35  | 74248<br>74249 | 1.85<br>1.95  |      | 4085           | .95            | 74C200           | 5.75           |
| 2.15<br>.35 | 74251          | .75           | À is | 4086<br>4093   | .95<br>.49     | 74C221<br>74C373 | 1.75<br>2.45   |
| .40         | 74259<br>74265 | 2.25<br>1.35  | - 8  | 4098           | 2.49           | 74C374           | 2.45           |
| .50<br>.35  | 74273          | 1.95          |      | 4099<br>14409  | 1.95<br>12.95  | 74C901<br>74C902 | .39<br>.85     |
| .65         | 74276<br>74279 | 1.25<br>.75   | П    | 14410          | 12.95          | 74C903           | .85            |
| .55         | 74283          | 2.00          | 1    | 14411<br>14412 | 11.95<br>12.95 | 74C905<br>74C906 | 10.95<br>.95   |
| .70<br>2.75 | 74284<br>74285 | 3.75<br>3.75  |      | 14419          | 7.95           | 74C907           | 1.00           |
| 1.75        | 74290          | .95           |      | 14433<br>4502  | 4.18<br>.95    | 74C908<br>74C909 | 2.00<br>2.75   |
| .30<br>.45  | 74293<br>74298 | .75<br>.85    |      | 4503           | .65            | 74C911           | 8.95           |
| .45         | 74256          | 2.25          |      | 4508<br>4510   | 1.95<br>.85    | 74C912<br>74C914 | 8.95<br>1.95   |
| .55<br>1.55 | 74365<br>74366 | .65           |      | 4511           | .85            | 74C914<br>74C915 | 1.19           |
| 1.20        | 74366<br>74367 | .65<br>.65    |      | 4512           | .85<br>1.25    | 74C918           | 2.75           |
| .29<br>.45  | 74368<br>74376 | .65           |      | 4514<br>4515   | 1.79           | 74C920<br>74C921 | 17.95<br>15.95 |
| .49         | 74376          | 2.20<br>1.75  |      | 4516           | 1.55<br>.89    | 74C922           | 4.49           |
| .45<br>.45  | 74393          | 1.35          |      | 4518<br>4519   | .89            | 74C923<br>74C925 | 4.95<br>5.95   |
| .55         | 74425<br>74426 | 3.15<br>.85   |      | 4520<br>4522   | .79            | 74C926<br>74C928 | 7.95           |
|             | 74490          | 2.55          |      | 4522           | 1.25<br>1.25   | 74C928<br>74C929 | 7.95<br>19.95  |

# **ODES**

| PN2222         | NPN SWITCH | TO-92  | 10/1.00 | 100/8.99   |
|----------------|------------|--------|---------|------------|
| PN2907         | PNP SWITCH | TO-92  | 10/1.25 | 100/10.99  |
| 2N2222         | NPN SWITCH | TO-18  | .25     | 50/10.99   |
| 2N2907         | PNP SWITCH | TO-18  | .25     | 50/10.99   |
| 2N3055         | NPN POWER  | TO-3   | .79     | 10/6.99    |
| 3055T          | NPN POWER  | TO-220 | .69     | 10/5.99    |
| 2N3904         | NPN SWITCH | TO-92  | 10/1.00 | 100/8.99   |
| 2N3906         | NPN SWITCH | TO-92  | 10/1.00 | 100/8.99   |
| IN4148 (IN914) | SWITCHING  |        | 25/1.00 | 1000/35.00 |
| IN4004         | RECTIFIER  |        | 10/1.00 | 100/8.99   |

© 1982 JDR MICRODEVICES, INC.

748570

74S571

2.95

1.95

74S162

|            |         | ı        | IN    | EAR     |      |         |      |                | RO           | CA             |            |
|------------|---------|----------|-------|---------|------|---------|------|----------------|--------------|----------------|------------|
| LM301      | .34     | LM348    | .99   | NE564   | 2.95 | LM1496  | .85  | CA 3023        | 2.75         | CA 3082        | 1.65       |
| LM301H     | .79     | LM350K   | 4.95  | LM565   | .99  | LM1558H | 3.10 | CA 3023        | 1.29         | CA 3082        | 1.55       |
| LM307      | .45     | LM350T   | 4.60  | LM566   | 1.49 | LM1800  | 2.37 | CA 3046        | 1.25         | CA 3086        | .80        |
| LM308      | .69     | LM358    | .69   | LM567   | .89  | LM1812  | 8.25 | CA 3059        | 2.90         | CA 3089        | 2.99       |
| LM308H     | 1.15    | LM359    | 1.79  | NE570   | 3.95 | LM1830  | 3.50 | CA 3060        | 2.90         | CA 3096        | 3.49       |
| LM309H     | 1.95    | LM376    | 3:75  | NE571   | 2.95 | LM1871  | 5.49 | CA 3065        | 1.75         | CA 3130        | 1.30       |
| LM309K     | 1.25    | LM377    | 1.95  | NE592   | 2.75 | LM1872  | 5.49 | CA 3080        | 1.10         | CA 3140        | 1.15       |
| LM310      | 1.75    | LM378    | 2.50  | LM703   | .89  | LM1877  | 3.25 | CA 3081        | 1.65         | CA 3146        | 1.85       |
| LM311      | .64     | LM379    | 4.50  | LM709   | .59  | LM1889  | 1.95 |                |              | CA 3160        | 1.19       |
| LM311H     | .89     | LM380    | .89   | LM710   | .75  | LM1896  | 1.75 |                |              |                |            |
| LM312H     | 1.75    | LM380N-8 |       | LM711   | .79  | LM2877  | 2.05 |                | 7            | -,             |            |
| LM317K     | 3.95    | LM381    | 1.60  | LM723   | .49  | LM2878  | 2.25 |                |              | <b>-</b>       |            |
| LM317T     | 1.19    | LM382    | 1.60  | LM723H  | .55  | LM2900  | .85  | TL494          | 4.20         | 75365          | 1.95       |
| LM318      | 1.49    | LM383    | 1.95  | LM733   | .98  | LM2901  | 1.00 | TL496          | 1.65         | 75450          | .59        |
| LM318H     | 1.59    | LM384    | 1.95  | LM741   | .35  | LM3900  | .59  | TL497          | 3.25         | 75451          | .39        |
| LM319H     | 1.90    | LM386    | .89   | LM741N- |      | LM3905  | 1.25 | 75107          | 1.49         | 75452          | .39        |
| LM319      | 1.25    | LM387    | 1.40  | LM741H  | .40  | LM3909  | .98  | 75110          | 1.95         | 75453          | .39        |
| LM320(see  |         | LM389    | 1.35  | LM747   | .69  | LM3911  | 2.25 | 75150          | 1.95         | 75454          | .39        |
| LM322      | 1.65    | LM390    | 1.95  | LM748   | .59  | LM3914  | 3.95 | 75154<br>75188 | 1.95<br>1.25 | 75491<br>75492 | .79<br>.79 |
| LM323K     | 4.95    | LM392    | .69   | LM1014  | 1.19 | LM3915  | 3.95 | 75189          | 1.25         | 75492<br>75493 | .89        |
| LM324      | .59     | LM394H   | 4.60  | LM1303  | 1.95 | LM3916  | 3.95 | 75105          | 1.23         | 75494          | .89        |
| LM329      | .65     | LM399H   | 5.00  | LM1310  | 1.49 | MC4024  | 3.95 |                |              | 73434          | .00        |
| LM331      | 3.95    | NE531    | 2.95  | MC1330  | 1.69 | MC4044  | 4.50 |                |              |                |            |
| LM334      | 1.19    | NE536    | 6.00  | MC1349  | 1.89 | RC4136  | 1.25 |                |              |                |            |
| LM335      | 1.40    | NE555    | .34   | MC1350  | 1.19 | RC4151  | 3.95 |                | D. /         |                |            |
| LM336      | 1.75    | NE556    | .65   | MC1358  | 1.69 | LM4250  | 1.75 |                | RI I         | ET             |            |
| LM337K     | 3.95    | NE558    | 1.50  | MC1372  | 6.95 | LM4500  | 3.25 | TL071          | .79          | TL084          | 2.19       |
| LM337T     | 1.95    | NE555    | .34   | LM1414  | 1.59 | LM13080 | 1.29 | TL072          | 1.19         | LF347          | 2.19       |
| LM338K     | 6.95    | NE556    | .65   | LM1458  | .59  | LM13600 | 1.49 | TL074          | 2.19         | LF351          | .60        |
| LM339      | .99     | NE558    | 1.50  | LM1488  | .69  | LM13700 | 1.49 | TL081          | .79          | LF353          | 1.00       |
| LM340 (see | e 7800) | NE561    | 24.95 | LM1489  | .69  |         |      | TL082          | 1.19         | LF355          | 1.10       |
| 1          |         |          |       |         |      |         |      | TL083          | 1.19         | LF356          | 1.10       |
|            | H = TO- | 5 CAN    | T =   | TO-220  | К    | = TO-3  |      |                |              | LF357          | 1.40       |

# RIBBON CABLE

| 001174070 | SINGLE COLOR |       | COLOR | CODED |  |
|-----------|--------------|-------|-------|-------|--|
| CONTACTS  | 1′           | 10'   | 1'    | 10'   |  |
| 10        | .50          | 4.40  | .83   | 7.30  |  |
| 20        | .65          | 5.70  | 1.25  | 11.00 |  |
| 26        | .75          | 6.60  | 1.32  | 11.60 |  |
| 34        | .98          | 8.60  | 1.65  | 14.50 |  |
| 40        | 1.32         | 11.60 | 1.92  | 16.80 |  |
| 50        | 1.38         | 12.10 | 2.50  | 22.00 |  |

**WE HAVE THE** COMPLETE LINE OF IDC AND **D-SUBMINIATURE** CONNECTORS

# WIREWRAP CARDS

FR-4 Epoxy Glass Laminate With Gold Plated Contact Fingers

# S-100 BUSS

| P100-1<br>P100-2<br>P100-3<br>P100-4 | Bare — No Foil Pads       15.95         Horizontal BUSS       22.95         Vertical BUSS       22.95         Single Foil Pads Per Hole       23.95 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                                      | APPLE                                                                                                                                               |
| P500-1<br>P500-3<br>P500-4           | Bare — No Foil Pads       15.95         Horizontal BUSS       22.95         Single Foil Pads Per Hole       23.95                                   |
|                                      | IBM                                                                                                                                                 |
| IBM-PR                               | BUSS Lines + Pads 55.00                                                                                                                             |
|                                      | GENERAL PURPOSE                                                                                                                                     |
| 22                                   | 2/44 PIN ( .156" SPACING)                                                                                                                           |
| P441-3                               |                                                                                                                                                     |
| P442-3                               | Vertical BUSS, 4.5" x 9" <b>14.95</b><br>36/72 PIN ( .1" SPACING)                                                                                   |

Vertical BUSS, 4.5" x 6" ..... 13.95 Vertical BUSS, 4.5" x 9" ..... 14.95

# BEST SELLING **BOOKS**

# OSBORNE/MC GRAW-HILL

| 68000 Assembly Language Programming | 16.99 |
|-------------------------------------|-------|
| SYBEX                               |       |
| Your Your First Computer            | 8.95  |
| The CP/M Handbook                   | 14.95 |
| The PASCAL Handbook                 | 18.95 |
| Microprocessor Interfacing          |       |
| Techniques                          | 17.95 |

# MICROCOMPUTER HARDWARE HANDBOOK

FROM ELCOMP — \$14.95

Over 800 pages of manufacturers data sheets on most commonly used IC's. Includes:

- \* TTL 74/74LS and 74F
- \* CMOS
- \* Voltage Regulators \* Memory RAM, ROM, EPROM \* CPU's 6800, 6500, Z80, 8080, 8085, 8086/8
- \* MPU support & interface 6800, 6500, Z80, 8200, etc.

# **VOLTAGE** REGULATORS

| -      | ~          |          |      |
|--------|------------|----------|------|
| 7805T  | .89        | 7905T    | .99  |
| 7808T  | .89        | 7908T    | .99  |
| 7812T  | .89        | 7912T    | .99  |
| 7815T  | .89        | 7915T    | .99  |
| 7824T  | .89        | 7924T    | .99  |
| 7805K  | 1.39       | 7905K    | 1.49 |
| 7812K  | 1.39       | 7912K    | 1.49 |
| 7815K  | 1.39       | 7915K    | 1.49 |
| 7824K  | 1.39       | 7924K    | 1.49 |
| 78L05  | .69        | 79L05    | .79  |
| 78L12  | .69        | 79L12    | .79  |
| 78L15  | .69        | 79L15    | .79  |
| 78H05K | 9.95       | LM323K   | 4.95 |
| 78H12K | 9.95       | UA78S40  | 1.95 |
|        | T = TO-220 | K = TO-3 |      |
|        | L = T(     | 0-92     |      |

# **DISK DRIVES**

# **TANDON**

TM100-1 51/4" (FOR IBM) SS/DD 229.00 TM100-2 5%" (FOR IBM) DS/DD 295.00

# **SHUGART**

SA 400L 5%" (40TRACK) SS/DD 199.95

# SIEMENS

FD100-8 8" SS/DD (801 REPLACEMENT) 259.00

# **PERTEC**

FD-200 54" SS/DD 179.95 FN-250 51/4" DS/DD 199.95

# CABINET FOR 51/4" DISK DRIVE

- \* COLOR MATCHES APPLE
- \* FITS SHUGART

SPECIAL — \$29.95

# BYPASS CAPS

.01 UF DISC 100/6.00 .1 UF DISC 100/8.00 .1 UF MONOLITHIC 100/15.00

**WE NOW STOCK A** COMPLETE LINE OF DISC, ELECTROLYTIC, **MONOLITHIC AND** TANTALUM CAPACITORS

# RESISTORS

1/4 WATT 5% CARBON FILM ALL STANDARD VALUES FROM 1 OHM TO 10 MEG OHM

**50 PCS. SAME VALUE** .025 FA

100 PCS. SAME VALUE .02 EA. 1000 PCS. SAME VALUE .015 EA.



P721-3

P722-3

# **IDR MICRODEVICES, INC.**

1224 S. Bascom Avenue San Jose, CA 95128 800-538-5000 • 800-662-6279 (CA) (408) 995-5430 • Telex 171-110

© 1982 JDR MICRODEVICES, INC.

**VISIT OUR RETAIL STORE** 

- NEW HOURS — M-W-F, 9-5 Th., 9-9 Sat. 11-3 T-Th., 9-9

PLEASE USE YOUR CUSTOMER NUMBER WHEN ORDERING

TERMS: For shipping include \$2 for UPS Ground or \$3 for UPS Blue Label Air. Items over 5 pounds require additional shipping charges. Foreign orders, include sufficient amount for shipping. There is a \$10 minimum order. Bay Area and Los Angeles Counties add \$10 so Sales Tax. Other California residents add \$50 sales Tax. We reserve the right to substitute manufacturer. Not responsible for typographical errors. Prices are subject to change without notice. We will match or beat any competitor's price provided it is not below our cost.

# 4116 16K DYNAMIC RAMS 250NS 8/\$1195 SET

**ALL MERCHANDISE 100% GUARANTEED!** 

**CALL US FOR VOLUME QUOTES** 

# NEW VIEWMAX 80

A **Full Function** 80 column card for Apple II\* — Compare these features with any other:

- 7x9 dot matrix; Upper and lower case with true descenders
- ★ Soft Video switch
- ★ Inverse video characters
- \* Shift key support
- Fully compatible with Apple\* DOS, CP/M\*, PASCAL, and most popular word processors
- **★ 2 YEAR WARRANTY**

\$219<sup>95</sup>

# JDR COOLING FAN

FOR YOUR APPLE II

- Easy installation no modification of Apple required
- \* Eliminates overheating problems
- ★ Switch on front controls fan, Apple, and extra outlet
- Rotron whisper fan is the quietest, most reliable on the market

69<sup>95</sup>

# **DISK DRIVE**

- \* Fully Apple\* compatible
- \* 35 Track Will read half tracks!
- Use with our controller (call for price) or with your Apple controller
- ★ Price includes case and cable ready to plug in
- ★ Attractive cabinet matches Apple drive
- ★ 90-Day Warranty

\$299<sup>95</sup>

ORDER TOLL FREE 800-538-5000 800-662-6279 (CALIFORNIA RESIDENTS)

IF YOU CAN FIND A PRICE LOWER ELSEWHERE, LET US KNOW AND WE'LL MEET OR BEAT THEIR PRICE! (SEE TERMS BELOW)

- \* Computer managed inventory virtually no back orders!
- \* Very competitive prices!
- \* Friendly staff!
- \* Fast service most orders shipped within 24 hours!

# JDR 16K RAMCARD

For Apple II\*

- ★ Expand your 48K Apple to 64K
- ★ Fully compatible with Apple Language System — Use in place of Apple Language card
- ★ Provides extra memory for Visicalc™
- \* Run PASCAL, FORTRAN, Integer Basic with appropriate software
- Highest quality card features: gold edge connector, sockets for all IC's

# **NOW WITH 2 YEAR WARRANTY**

| ASSEMBLED & TESTED WITH WARRANTY        | <b>\$44</b> 95             |
|-----------------------------------------|----------------------------|
| KIT — INCLUDES ALL PARTS & INSTRUCTIONS | \$40 <sup>95</sup>         |
| BARE PC CARD WITH INSTRUCTIONS          | \$ <b>14</b> <sup>95</sup> |





# **MONITORS**

**GREEN PHOSPHOR** 

NEC JB1201M \$16900

**ZENITH ZVM-121** \$11900

**COLOR** 

AMDEK color 1 \$33500

# OKIDATA PRINTERS

- ★ 120 cps. 9x9 Dot Matrix
- ★ 50% faster than EPSON
- ★ Parallel and Serial interfaces are standard

ML-82A ...... \$47950 ML-83A ..... \$6995 ML-84 PARALLEL ... \$105900 CALL FOR PRICES ON 82A TRACTOR OPTION

AND 82A, 83A GRAPHICS OPTION. CABLES

# 51/4" DISKETTES

ATHANA SS SD SOFT . . . 24.95
MEMOREX SS SD SOFT 26.95
VERBATIM SS DD SOFT 29.95
VERBATIM 10 SECT. HARD 29.95

# **NASHUA**

TOP QUALITY — LOW PRICE! Single Sided, Single Density Soft Sectored with Hub Ring

\$19.95 BOX OF 10

# NEWPORT PROSTICK

- Professional Quality Atari-Type Joystick
- ★ Extremely Rugged Actual Arcade game Joystick
- ★ All parts are replaceable
- ★ 6 Month Warranty

\$3100 EA \$5995 PR



AND INTÉRFACE CARDS AVAILABLE

# POWER SUPPLY \$3995

MOUNTED ON PC BOARD MANUFACTURED BY CONVER +5 VOLT 4 AMP ±12 VOLT 1 AMP SPECIAL THANKS TO MARC AND AL FOR THEIR HARD WORK AND DEDICATION

\*APPLE IS A TRADEMARK OF APPLE COMPUTER, INC.

© 1982 JDR MICRODEVICES, INC.



# Palomar: first word in savings, final word for service!

Depend on Palomar for great backup: (1) Expert technical advice. (2) Fast response on orders. (3) In-house service. (4) Guaranteed satisfaction.

# FRANKLIN SPECIAL

# **Save 28%**

Franklin Ace 1000 \* . . . \$1,330.00
TEAC Super 5 Disk Drive
 with Controller . . . . 495.00
Gemini 10 . . . . . . . 499.00
Genie Graphics Card . . . 159.00

| Taxan 12"     |            |
|---------------|------------|
| Green Screen  | 169.00     |
| Diskettes     | 35.00      |
| Diskette Case | 5.00       |
|               | \$2,692.00 |

\*Add \$200 for Apple II/48K

NOW-\$1.94500

# **PRINTERS**

| COMREX Comriter CR-1C Tractor Feed                                                                                                                                                                                                                                         |                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| EPSON ASAP 2K Serial Comrex 4K Buffer Microbuffer-16K Parallel Microbuffer-8K Serial                                                                                                                                                                                       | 139.00                                                                                                         |
| NEC 3510 R0 Serial 3520 KSR Serial 3520 KSR Serial 3530 R0 Parallel 3550 R0 IBM 7710 R0 Serial 7730 R0 Parallel 8023-A Dot Matrix Bi-Directional Tractor (3500) Envelope Handler (3500) Horizontal Tractor (7700) Bi-Directional Tractor (7700) Friction Attachment (7700) | 2100.00<br>1750.00<br>1880.00<br>2465.00<br>2465.00<br>549.00<br>230.00<br>90.00<br>270.00<br>150.00<br>345.00 |
| NOVELL<br>Image 800                                                                                                                                                                                                                                                        | 999.00                                                                                                         |

| .519.00          |
|------------------|
| .775.00          |
| 1250.00          |
| 1150.00          |
| 129.00           |
| 55.00            |
|                  |
| 999.00           |
| .799.00          |
| .250.00          |
| .135.00          |
|                  |
| .649.00          |
|                  |
| CALL             |
| CALL             |
|                  |
| .== 0.           |
| .475.00          |
| .499.00          |
| .650.00          |
| 750.00<br>789.00 |
| 709.UU           |
|                  |

# **MODEMS**

| HAYES                       |       |
|-----------------------------|-------|
| Micromodem II (Apple II),   | 299.0 |
| Micromodem II With Terminal |       |
| Program                     | 315.0 |
| Micromodem 100 (S-100)      | 349.0 |
| Smartmodem (RS-232)         | 225.0 |
| Chronograph (RS-232)        | 195.0 |
| Terminal Program            | 75.0  |
| UDS                         |       |
| 103 LP Direct               | 175.0 |
| 103 JLP Auto Answer         | 209.0 |
| 202 SLP 1200 BAUD           | 255.0 |
| 212 LP                      | 469.0 |
|                             |       |
|                             |       |

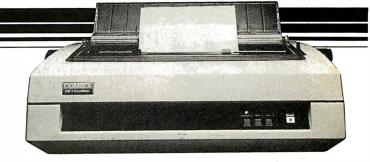
| NOVATION         |        |
|------------------|--------|
| CAT (Acoustic)   | 149.00 |
| D-CAT            | 165.00 |
| Auto CAT (300)   | 215.00 |
| 212 Auto CAT     |        |
| Apple CAT II     | 299.00 |
| 212 Apple CAT    | 615.00 |
| Expansion Module | 35.00  |
| Handset          | 27.00  |
| Firmware ROM     | 27.00  |

# **Order Toll-Free!**

# **SUPPLIES**

| PRINTWHEELS               | VERBATIM      |
|---------------------------|---------------|
| Comrex 18.00              | 5¼" SSDD 3.29 |
| NEC (Thimble)14.95        | 5¼" DSDD      |
| Olympia(Whisperdisc)30.00 | 5¼" SSQD4.50  |
| Smith Corona4.95          | 5¼" DSQD6.00  |

Many items are not listed. Please call our 800 number if you don't see what you're looking for.



# **APPLE**

| HARDWARE           Apple II Plus         CAL           ALS Z Card         219 G           ALS Z Card         369 G           ALS Z Card         175 C           CCS REEE Card         175 C           CCS A ROMPRION Module         105 C           CCS Programmable Timer         105 C           CORMERC MICK Card         65 G           CPS Multifunction Card         179 C           Ecolon U Speech Synthesize         175 C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | O Corona 10MB Winchester Disk II With Controller Card Microsci A35 With Controller C Microsci Controller Card Rana Disk Drive Rana Controller TEAC Super 5 Disc Drive TEAC Super 5 Controller Card | CALL<br>CALL<br>ard 375.00<br>99.00<br>359.00<br>109.00<br>299.00 | Apple Mechanic DOS Boss Uffity City S A M Apple Soft Comprier Basic Compiler The Artist Zoom Graphics | 2100<br>18.00<br>21.00<br>9900<br>135.00<br>29900<br>5900 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| ALS 2 Card<br>ALS 2 Card, with Supercalc<br>CCS IEEE Card<br>CCS 12K ROM/PRIOM Module<br>CCS 12K ROM/PRIOM Module<br>CCS Programmable Timer<br>COS Programmable Timer<br>COS Programmable Timer<br>COPS Multifunction Card<br>EPS Multifunction Card<br>Expo II Speech Synthesizer<br>175 (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | O Corona 10MB Winchester Disk II With Controller Card Microsci A35 With Controller C Microsci Controller Card Rana Disk Drive Rana Controller TEAC Super 5 Disc Drive TEAC Super 5 Controller Card | CALL<br>375.00<br>99.00<br>359.00<br>109.00<br>299.00             | Utility City<br>S A M<br>Apple Soft Comprier<br>Basic Compiler<br>The Artist                          | 21.00<br>9900<br>135.00<br>29900<br>5900                  |
| ALS Z Card. with Supercalc 369 C<br>CES EEE Card 105 C<br>CCS Analog/Digital Card 105 C<br>CCS 12K ROM/PROM Module 109.0<br>CCS Programmable Timer 105 C<br>Comrex Clock Card 59.0<br>CPS Multifunction Card 1790<br>Ebbo II Speech Synthesizer 175.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | O Disk II With Controller Card Microsci A35 With Controller C Microsci Controller Card Rana Disk Drive Rana Controller TEAC Super 5 Disc Drive TEAC Super 5 Controller Card                        | 99.00<br>99.00<br>359.00<br>109.00<br>299.00                      | S A M<br>Apple Soft Comprier<br>Basic Compiler<br>The Artist                                          | 9900<br>13500<br>29900<br>5900                            |
| CCS IEEE Card 175 C CCS Analog/Digital Card 105 C CCS 12K ROM/PROM Module 109 C CCS Programmable Timer 105 C Comrex Clock Card 69 C CPS Multifunction Card 179 C Etho II Speech Synthesizer 175 C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Microsci A35 With Controller Co Microsci Controller Card Hana Oisk Orive Rana Controller TEAC Super 5 Disc Drive TEAC Super 5 Controller                                                           | 99.00<br>359.00<br>109.00<br>299.00                               | Apple Soft Comprier<br>Basic Compiler<br>The Artist                                                   | 135.00<br>29900<br>5900                                   |
| 105 C   105 | O Rana Disk Drive Rana Controller TEAC Super 5 Disc Drive TEAC Super 5 Controller Card                                                                                                             | 359.00<br>109.00<br>299.00                                        | Basic Compiler<br>The Artist                                                                          | 29900<br>5900                                             |
| CCS 12K ROM/PROM Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | O Rana Disk Drive Rana Controller TEAC Super 5 Disc Drive TEAC Super 5 Controller Card                                                                                                             | 109.00<br>299.00                                                  | The Artist                                                                                            | 5900                                                      |
| CCS Programmable Timer         105.0           Comrex Clock Card         69.0           CPS Multifunction Card         1790           Echo II Speech Synthesizer         175.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 Rana Controller<br>0 TEAC Super 5 Disc Drive<br>0 TEAC Super 5 Controller Card                                                                                                                   | 299.00                                                            |                                                                                                       |                                                           |
| Comrex Clock Card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | O TEAC Super 5 Disc Orive O TEAC Super 5 Controller Card                                                                                                                                           |                                                                   |                                                                                                       |                                                           |
| CPS Multifunction Card 1790<br>Echo II Speech Synthesizer 175.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0 TEAC Super 5 Controller Card                                                                                                                                                                     | 90.00                                                             |                                                                                                       | 35.00                                                     |
| Echo II Speech Synthesizer 175.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                    |                                                                   | GAMES                                                                                                 |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    |                                                                   | Temple of Apshai                                                                                      | 29.00                                                     |
| EDP AC Surge Protector 49.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                    |                                                                   | Datestone s o F Ryn                                                                                   | 15.00                                                     |
| FDP FMI-RFI Filter 390                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                    |                                                                   | Morloc's Tower                                                                                        | 15.00                                                     |
| Expandaport-6 Ports With Speaker 55.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | JOFTWARE                                                                                                                                                                                           |                                                                   | Rescue at Rigel                                                                                       | 2100                                                      |
| Haves Micromodem (I 299.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | N BOSINESS                                                                                                                                                                                         |                                                                   | Intro 3-Pak (Ryn. Morioc. Rigel)                                                                      | 3900                                                      |
| Microbulfer II 16K 219.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | o d Base II                                                                                                                                                                                        | 539.00                                                            | Crush, Crumble and Chomp                                                                              | 21.00                                                     |
| Microbuller II 32K 2450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                    | 5500                                                              | Dragon's Eve                                                                                          | 19 00                                                     |
| Microsoft Z80Softcard 265.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                    | 99.00                                                             | Chop Litter                                                                                           | 25.00                                                     |
| Microtek 16K Ram Card 791                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                    | 99.00                                                             | Apple Panic                                                                                           | 21.00                                                     |
| Microtek Parallel Printer Card 69                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                    | 6900                                                              | Arcade Machine                                                                                        | 35.00                                                     |
| Microtek Graphics Card 1099                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                    | 99.00                                                             | Star Blazer                                                                                           | 2500                                                      |
| Microtek Graphics Card—16K 185.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                    | 235.00                                                            | Serpentine                                                                                            | 25.00                                                     |
| Mountain Computer Romwriter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | no D.B. Master                                                                                                                                                                                     | 179.00                                                            | Rasier Blasier                                                                                        | 21.00                                                     |
| Mountain Computer Rombus (32K) 179.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DB. Master Utility Pak = 1                                                                                                                                                                         | 7900                                                              | Deadline                                                                                              | 35.00                                                     |
| MPC Serial Printer Card 89                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                    | 79.00                                                             | Starcross                                                                                             | 29.00                                                     |
| M & R Super Fan 400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | No VisiCalc                                                                                                                                                                                        | 20500                                                             | Zoik I                                                                                                | 29.00                                                     |
| Novation Apple Cat 299                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                    | 205.00                                                            | Zork il                                                                                               | 29.00                                                     |
| Novation Expansion Module 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                    | 24900                                                             | Zork III                                                                                              | 29.00                                                     |
| Novation Handset 27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                    | 8500                                                              | Snack Attack                                                                                          | 2 1.00                                                    |
| Numeric Key Pad 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                    | 205.00                                                            | Prism                                                                                                 | 15 00                                                     |
| Paymar Lower Case Adapters:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | VisiFile                                                                                                                                                                                           | 20500                                                             | Castle Wolfenstein                                                                                    | 21.00                                                     |
| Old (Rev. 1-6) 29                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | visiSchedule                                                                                                                                                                                       | 249.00                                                            | Robot Wars                                                                                            | 29.00                                                     |
| New (Rev. 7) 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    | 10900                                                             | Three Mile Island                                                                                     | 29.00                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    | 75.00                                                             | Frogger                                                                                               | 25.00                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 00                                                                                                                                                                                                 | 9900                                                              | Cannon Ball Blilz                                                                                     | 25.00                                                     |
| STB 128K Memory Card 399<br>System Saver-Fan/Dutlets/Switch 79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                    |                                                                   | Warp Destroyer                                                                                        | 2100                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    | 29.00                                                             | Audex                                                                                                 | 21.00                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    | 29.00                                                             | Autobalin                                                                                             | 21.00                                                     |
| TG Joy Slicks 45.<br>TG Select-A-Port 45.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                    | 39.00                                                             | Bandits                                                                                               | 2500                                                      |
| Videx 80 Column Card 279                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                    | 21 00                                                             | Beer Run                                                                                              | 21 00                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    | 21 00                                                             | Borg                                                                                                  | 2100                                                      |
| Videx Enhancer II (Rev 7) 125.<br>Videx Function Strip 65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                    | 3900                                                              | Cops & Robbers                                                                                        | 2500                                                      |

Palomar offers a complete selection of Apple Hardware and Software.

**SOFTWARE** 

Denver Accounting System

HOME & PERSONAL

The Home Acccount + Money Decisions

BUSINESS

d Base II

Easy Filer

Easy Planner

Easy Writer II VisiCalc

Mathmagic

Graphmagic GAMES

Zork III

Temple of Apshai

Galactic Attack

# **IBM**

| HARDWARE                            |          |
|-------------------------------------|----------|
| IBM PC                              | CALL     |
| Amdek Color II RGB Monitor          | 799.00   |
| Amdek 3" Dual Disk Drive            | 785.00   |
| Corona 5MB Winchester               | CALL     |
| Corona 10MB Winchester              | CALL     |
| M & R SuperMod/5                    |          |
| Percom Add On DiskDrive (Dual)      |          |
| PMC Disk Drive                      | 199.00   |
| STB I/O Printer Interface (4 Ports) |          |
| STB 64K I/O Memory Card             |          |
| Tandon TM 100-1 Disk Drive          |          |
| Tandon TM 100-2 Disk Drive          |          |
| TG Joysticks                        |          |
| Tech Adam & Eve Paddles             |          |
| 64K Kit (9 64K x 1 Chips)           | .119.00  |
| 64K RAM Card                        | . 199.00 |
|                                     |          |

# S-100 HARDWARE

| Tandon TM 100-1 Disk Drive    | 219.00   |
|-------------------------------|----------|
| Tandon TM 100-2 Disk Drive    | .299.00  |
| CCS Disk Controller/CPM 2.2   | .375.00  |
| CCS 16K Static Ram Module     | 259.00   |
| CCS 32K Static Ram Module     | .439.00  |
| CCS 2 Serial Port + 2Parallel | .315.00  |
| Comrex Clock Card             | . 119.00 |
| Hayes Micromodem 100          | .349.00  |
|                               |          |

# CP/M SOFTWARE

499 00

549.00

295.00

145.00

259.00 205.00

109 00

145.00

65.00

29.00

29.00

29.00

| CCS CP/M Control Program 2.2  | 129.00 |
|-------------------------------|--------|
| CCS CP/M Macro Assembler      | 79.00  |
| CCS CP/M Symb. Instr. Debug   | 65.00  |
| CCS CP/M Text Formatter       | 65.00  |
| Hayes Terminal Program (8")   | 22.00  |
| Microsoft Fortran 80 (8")     | 385.00 |
| Microsoft Basic Compiler (8") | 299.00 |
| Microsoft Basic 80 (8")       | 269.00 |
|                               |        |

# **ACCESSORIES**

| CABLES CENTRONICS     |       |
|-----------------------|-------|
| Centronics/Centronics | 25.00 |
| Centronics/Atari      | 30.00 |
| Centronics/IBM        | 30.00 |
| Centronics/Osborne    | 30.00 |
| Centronics/S-100      | 30.00 |
| Centronics/TRS I, III | 30.00 |

| RS-232                    |       |
|---------------------------|-------|
| 4 Wire, M/M,M/F-10 FT     | 18.00 |
| 9 Wire, M/M,M/F-10 FT     | 20.00 |
| 12 Wire, M/M,M/F-10 FT    | 21.00 |
| 25 Wire, M/M,M/F-10 FT    |       |
| MANY MORE CABLES AVAILABL | ECALL |
| OUR 800#.                 |       |
|                           |       |



# PERSONAL COMPUTERS

| ALIUS              |         |
|--------------------|---------|
| ACS 8000-2         | 3199.00 |
| ACS 8000-15        | 4399.00 |
| APPLE              |         |
| Apple II Plus      | CALL    |
| Disk II D.O.S. 3   |         |
| Disk II            | CALL    |
| BASIS              |         |
| 108-0003 (64K)     | 1895.00 |
| 108-0004 (128K)    | 1995.00 |
| FRANKLIN           |         |
| ACE 1000 (64K)     | CALL    |
| ACE 10, Disk Drive |         |
|                    |         |

| Osborne i Portable, Includes \$200 |     |
|------------------------------------|-----|
| Extras1795                         | .00 |
| KAYCOMP                            |     |
| Kaypro Portable, Includes \$250    |     |
| Extras1795                         | .00 |
| TELEVIDEO                          |     |
| TS 8023119                         | .00 |
| TS 8065735                         | .00 |
| TS 816 10365                       | .00 |

**OSBORNE** 

Palomar is pledged to your satisfaction.

# **MONITORS**

| COMREX CR 5500-12" Green CR 6500-13" Composite CR 6600-13" RGB                                                         | 315.00                     |
|------------------------------------------------------------------------------------------------------------------------|----------------------------|
| AMDEK Video 300-12" Green Color I -13" Color Composite Color III -Hi Res. RGB Color III -Lo Res. RGB RGB Apple II Card | 165.00<br>365.00<br>799.00 |

| U.S.I.                |        |
|-----------------------|--------|
| 9" Green Screen       | 119.00 |
| 9" Amber Screen       | 155.00 |
| 12" Green Screen      | 155.00 |
| 12" Amber Screen      | 175.00 |
| TAXAN                 |        |
| KG 12N-12" Green      | CALL   |
| KA 12N-12" Amber      | CALL   |
| RGB Vision I-12" RGB  | CALL   |
| RGB Vision II-12" RGB | CALL   |
|                       |        |



Palomar makes buying easy ...



**ORDER TOLL-FREE! Call** 

In California call 800-338-5555

Telex 697120-150

TERMS OF SALE: Cash, Check, money order, bank wire transfer, credit card, or purchase orders from qualified firms and institutions. Please include telephone number with order and expiration date on credit card orders. California residents add 6% sales tax. Advertised prices are for prepaid orders F.O.B. shipping point. Add 3% or \$3.00 minimum for shipping in the U.S. Pricing and availability subject to change without notice. Address written orders to:

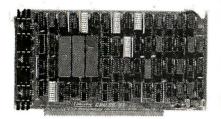
910-105 W. San Marcos Blvd., Dept. B-2, San Marcos, CA 92069



# THERE ARE NO BETTER BOARDS — THERE ARE NO BETTER PRICES!

# **ompuPro**

# FROM PRIORITY ONE ELECTRONICS



# CPU BOARDS CO-PROCESSOR 8086/8087

16 bit 8 or 10 MHz 8086 CPU with sockets for 8087 and 80130

| Description L           | ist Price                                                                  | <b>Dur Price</b>                                                                                                                                                                        |
|-------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A&T 8MHz 8086 only \$   | 695.00                                                                     | \$624.89                                                                                                                                                                                |
| CSC 10MHz 8086 only S   | 85000                                                                      | \$764.89                                                                                                                                                                                |
| A&T with 8087 option \$ | 995.00                                                                     | \$925.00                                                                                                                                                                                |
| CSC with 8087 option*5  | 1150.00                                                                    | \$1065.00                                                                                                                                                                               |
|                         | A&T 8MHz 8086 only \$<br>CSC 10MHz 8086 only \$<br>A&T with 8087 option \$ | Description         List Price           A&T 8MHz 8086 only \$695.00         CSC 10MHz 8086 only \$850.00           A&T with 8087 option \$995.00         CSC with 8087 option \$915.00 |

# 816 DUAL PROCESSOR 8085-8088

6 or 8 MHz provides true 16 Bit Power with a standard 8 bit S-100 bus

| BNGBT1612A  | A&T 6MHz    | \$425.00 | \$398.89 |
|-------------|-------------|----------|----------|
| BN GBT1612C | CSC 6/8 MHz | \$525.00 | \$497.89 |

### 68K - 68000 16 BIT CPU

16 bit 8 or 10 MHz on-board sockets for 2716, 2732, or 2764 EPROMs for ip to 8K x 16 of memory BNBT184A A&T 8MHz \$695.00 \$625.00 \$625.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.00 \$765.

# FORTH OPERATING SYSTEM FOR 68K CPU

Requires a DISK 1. IS4K of CompuPro memory, and an INTERFACER ∂ or 4. BNGBT68K0S FORTH operating system \$200.0

# CPUZ - Z80B CPU NOW 6MHz!

3/6 MHz Z80B CPU with 24 Bit Addressing.

FASTEST Z80 CPU AVAILABLE!

BNGBT1604 3/6 MHz A&T \$295.00 \$279.89

BNGBT160C 3/6 MHz CSC \$395.00 \$374.89



\*When 2 or more 8" disk drives are purchased with Disk 1 Controller.

# **DISK CONTROLLERS**

# DISK 1 FLOPPY CONTROLLER - OUR BEST!

Fast DMA, Soft Sector, Controls Up To Four 8" or 5 %" Single or Double Density Drives.

| BNPDB171ACPN | A&T w/CPM 2.2 & BIOS \$670.00    | \$495.00 |
|--------------|----------------------------------|----------|
|              | *When purchased with two 8"      | \$450.00 |
|              | disk drives only,                |          |
| BNPDB171CCPF | CSC w/CP/M 2.2 & BIOS \$770.00   | \$595.00 |
| BNGBT171A    | Disk 1 Controller A & T \$495.00 | \$449.89 |
| BNGBT171C    | Disk 1 Controller CSC \$595.00   | \$550.00 |
| BNGBTCPM80   | CP/M 2.2 for Z80/8085 w/manua    | al &     |

BIOS 8" S/D disk. \$174.89 CP/M 2.2 for 8086 w/manuals & BIOS 8" S/D disk \$299.89

# DISK 2/SELECTOR CHANNEL HARD DISK CONTROLLER

Fast DMA 2 board set. controls 4 Shugart 4000 series or Fujitsu 23/0 type drives. Includes CP/M 2.2'
BN6BT177A Assembled & Tested \$795.00 \$750.00
BN6BT177C CSC \$895.00 \$850.00



# CMOS RAM SALE!

# RAM 17 - 64K CMOS STATIC RAM

12 MHz. RAM 17.2 Watt, DMA Compatible 24 Bit Addressing

| Part No.    | Description   | List Price Our Price |
|-------------|---------------|----------------------|
| BNGBTRAM17  | 64K A&T 10MHz | \$319.00             |
| BNGBT175A64 | 64K A&T 12MHz | \$599.00 \$549.89    |
| BNGBT175C64 | 64K CSC 12MHz | \$699.00 \$650.00    |

# RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit
12 MHz, RAM 16, 32K x 16 or 64K x 8

 BNBE FIAMI6
 64K A&T 10MHz
 \$349.00

 BNBETIBIOA
 64K A&T 12MHz
 \$650.00
 \$598.89

 BNBETIBIOA
 64K CSC 12MHz
 \$750.00
 \$698.89



# NEW! RAM 21 - 128K STATIC RAM

■ RAM 21 12MHz, 128K x 8 or 64K x 16 IEEE/696 8 or 16 int. 1.2 Amps. 24 Bit Addressing BNBBT190A 128K A&T \$1350.00 \$1225.00 BNBBT190C 128K CSC \$1450.00 \$1375.00

# M-DRIVE SOLID STATE DISK DRIVE, 3500% FASTER!!

Not really, but the next best thing for CompuPro 8085/88
Users Call for Details on M-Drive
M-Drive requires a 6MHz CPU 8085/88 dualprocessor, Disk

1 DMA disk controller and System Support 1 Multifunction Board.

| 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Multifunction Board | 1 Mu

# M-DRIVE/H HARDWARE LOGICAL DISK SYSTEM

Interfaces through wo I/O ports, and runs at 10MHz. IEEE 696 compatible. Requires any CompuPro CPU and a Disk 1. Each bourd contains 512K of fast, low power (900mA) RAM, with parity checking.

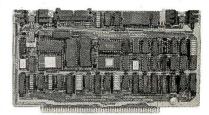
BN GBT197A M-DRIVE/H w/software, A&T \$189500 \$1775.00 BNGBT197C M-DRIVE/H w/software, CSC \$209500 \$1950.00



# S-100 MAINFRAME

110V 60Hz CVT Mainframe uses famous 20 slot CompuPro Motherboard (55 lbs.)

BNGBTENC20RM 20 Slot Rackmount \$895.00 \$825.00 BNGBTENC200K 20 Slot Desk Top \$825.00 \$760.00



# I/O BOARDS

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD Serial port (software prog. baud), 4K EPROM or RAM

provision, 15 levels of interrupt, real time clock, optional math processor

| Part No.    | Description          | List Price | Our Price |
|-------------|----------------------|------------|-----------|
| BNGBT162A   | Assembled & Tested   | \$395.00   | \$359.89  |
| BNGBT162C   | CSC                  | \$495.00   | \$459.89  |
| BNGBT6231   | Math Chip            |            | \$195.00  |
| BNGBT8232   | Math Chip            |            | \$195.00  |
| BNGBT162AM1 | A&T w/8231 Math Chip | )          | \$490.00  |
| BNGBT162CM1 | CSC w/8231 Math Chip | )          | \$654.89  |
| BNGBT162AM2 | A&T w/8232 Math Chip | )          | \$490.00  |
| BNGBT162CM2 | CSC w/8232 Math Chip | )          | \$654.89  |

### MPX CHANNEL BOARD

| I/O Multiple: | xer, using | 8085A- | 2 CPU | on board | w/4K RAM |
|---------------|------------|--------|-------|----------|----------|
| BNGBT166A4    | Assembl    | ed & 7 | ested | \$495.00 | \$444.89 |
| BNGBT166C4    | CSC        |        |       | \$595.00 | \$534.89 |

With 16K RAM
BNGBT166A16 Assembled & Tested
BNGBT166C16 CSC \$584.89
\$584.89
\$749.00
\$674.89

# **INTERFACER 1**

Two Serial I/O

BNGBT133A Assembled & Tested \$249.00 **\$218.89** BNGBT133C CSC \$324.00 **\$288.89** 

# **INTERFACER 2**

### Three parallel, one serial I/O board ### S218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.89 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 ### \$218.80 #

# INTERFACER 3

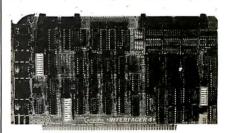
 Eight-channel multi-user serial I/O board

 BNBB1148A
 Assembled & Tested
 \$699.00
 \$628.89

 BNBB1148C
 CSC 200 hr. 8 port
 \$849.00
 \$748.89

 BNBB11745C
 Assembled & Tested
 \$599.00
 \$588.89

 BNBB11745C
 CSC 200 hr. 5 port
 \$699.00
 \$628.89



# **INTERFACER 4**

 Three Serial, 1 Parallel, 1 Centronics Parallel

 BHGBT187A
 Assembled 1 Tested
 \$395.00
 \$314.89

 BHGBT187C
 CSC
 \$495.00
 \$414.89

# SPECTRUM COLOR GRAPHICS

 Color Graphics board with Parallel I/O

 BHGBT144A
 Assembled & Tested
 \$299.00
 \$285.00

 BHGBT144C
 CSC
 \$395.00
 \$375.00

# S-100 MOTHERBOARDS

Active termination, 6-12-20 Slot RNGRT153A A&T 6 slot, 2 lbs. \$140.00 \$125.00 BNGBT153C CSC 6 slot, 2 lbs. \$190.00 \$155.00 A&T 12 slot, 3 lbs. \$155.00 BNGBT154A \$175.00 \$220.00 RNGRT154C CSC 12 slot, 3 lbs. \$240.00 \$235.00 BNGBT155A \$265.00 A&T 20 slot, 4 lbs. CSC 20 slot, 4 lbs. \$340.00 \$310.00

# CompuPro 10 MHz 64KBytes s-100 STATIC RAM - ULTRA LOW POWER - ONLY 2 WATTS \$299\*\* ASSEMBLED & TESTED - ONE YEAR WARRANTY

UNBELIEVABLE! While the rest of the industry struggles to attain 6MHz, CompuPro has effortlessly jumped from 10 to 12MHz. The power consumption (400mA; 2 Watts) is still the lowest in spite of running nearly twice as fast. Priority One Electronics has purchased the remainder of CompuPro's 10MHz boards and are offering them at these unprecedented prices.

- Extremely low power consumption (2 watts typical)
- Flawlessly handles any DMA device per IEEE 696 specifications

  • Single +5 Volt operation (requires no other
- supply voltages)
- Switch-Selectable choice of 24 address lines conforming to IEEE 696/S-100 extended addressing
- 2K windows, individually selectable at E000, E800, F000, and F800 permits use with older memory-mapped disk controllers or ROM (i.e., Morrow, NorthStar)
- Any 16K block may be disabled; dip switch selectable 2K disable from XXE000 FFFF in
- Switch Selectable PHANTOM disable

**RAM 17** 



PRICE: \$319.00 ea.

List Price: \$599.00

\$299.00 ea. More: BNGBTRAM17 Assembled & Tested

- Board addressable as one 64 K x 8 or 32 K x 16 block: DIP switch selectable on any 64K houndary
- Extremely low power consumption (2 watts) typical)
- Meets or exceeds all IEEE 696/S-100 specifications
- Flawlessly handles any DMA device per IEEE 696 specifications
- Single +5 Volt operation (requires no other supply voltages)
- 24 bit addressing; conforms to IEEE 696 specifications
- 8 or 16 bit data transfer dependant on SXTRQ. Conforms with IEEE 696 timing requirements for XTRQ and SIXTN



SALF PRICE:

\$349.00 ea.

More:

\$325.00 ea.

BNGBTRAM16 Assembled & Tested

# ompuPro<sup>™</sup>

**NEW 16 BIT** 12 USER



# SAVE OVER \$4000.00 ON SYSTEM & TERMINAL!

The System 816/D is a high performance, multi-user, multi-tasking 16bit system, with the power needed for involved applications such as software development. This is the preferred system for business. industrial or scientific environments. In addition, the 816/D delivers spooling (simultaneous printing and editing) to further increase productivity

- 10MHz 16 bit 8086 CPU with 80130 operating system firmware
- 512K bytes of fow power RAM
- 1 megabyte of M-DRIVE/H high speed solid state fogical disk
- Fast DMA floppy controller with 2 double sided 8" disk drives; 2.4 megabytes of storage
- 20 slot desk top S-100 enclosure
- 12 serial interfaces
- 1 parallel 1 Centronics parallel interface

Software: CP/M-86, MP/M-86, SuperCalc

Convenience features: clock/calendar; interrupt controllers; interval timers, and co-processor and Operating System Firmware option-This System 816/D is priced at \$13,995.00, a savings of over \$3,000 if alf of the components were purchased separately.

| Part No.    | Des   | scription                            | Price       |
|-------------|-------|--------------------------------------|-------------|
| BNGBTSYS816 | OOA   | Multiuser 16 bit desk top system A&T | \$13,995.00 |
| BNGBTSYS816 | 00C   | Multiuser 16 bit desk top system CSC | \$15,995.00 |
| BNGBTSYS816 | 00A21 | Same as above with RAM 21s, A&T      | \$14,395.00 |
| BNGBTSYS816 | 00C21 | Same as above with RAM 21s, CSC      | \$16,395.00 |
| _           |       |                                      | _           |

# OASIS 16 SYSTEM 816/016

All the hardware mentioned with the System 816/D with the OASIS 16 Operating System and utilities instead of CP/M-86, MP/M-86, and

| oupci ouic.      |                                      |            |
|------------------|--------------------------------------|------------|
| BNGBTSYS8160DA   | Mulliuser 16 bit desk top system A&T | \$13,995.0 |
| BNGBTSYS81600C   | Multiuser 16 bit desk top system CSC | \$15,995.0 |
| BNGBTSYS81600A21 | Same as above with RAM 21s, A&T      | \$14,395.0 |
| BNGBTSYS816DDC21 | Same as above with RAM 21s CSC       | \$16,395.0 |

# VISUAL 330 With the purchase of

any CompuPro System D AN ADDITIONAL

SAVINGS **VALUE OF:** 

\$1049.00

**VSL330GN** Specifications in column at right

# 

330 AND 300

# SORRY TELEVIDEO.

# THIS IS THE NEW STANDARD

The microprocessor-based VISUAL 330 combines VISUAL ergonomic elegance with selectable emulations of the DEC VT52°, Data General D200, Lear Siegler ADM-3A, and Hazeltine 1500 terminals.

IAIISIN

nehiVeleT IAIIZIV

| Specifications                 | 330   | 300 | 950 |
|--------------------------------|-------|-----|-----|
| ANSI X3 64 Specified           | NO    | STD | NO  |
| Solid State Keyboard           | STD   | STD | NO  |
| Programmable Non-volatile      |       |     |     |
| Function Keys                  | STD   | STD | NO  |
| Video Attributes Require No    |       |     |     |
| Display Space                  | STD   | STD | NO  |
| Smooth Scroll, Slow Scroll     |       |     |     |
| and Jump Scroll                | STD   | STD | NO  |
| Non Volatile Set-up Modes,     |       |     |     |
| "Menu" Style                   | STD   | STD | NO  |
| Block Graphics                 | STD   | STD | NO  |
| Sculptured Keycaps,            |       |     |     |
| Matted for Low Glare           | STD   | STD | NO  |
| Programmable Non Volatile      |       |     |     |
| Columnar Tabbing               | STD   | STD | NO  |
| Choice of Typomatic/Non-       |       |     |     |
| Typomatic Keyboard             | STD   | STD | NO  |
| 14" Screen                     | OPT   | OPT | NO  |
| N-Key Rollover                 | STO   | STD | NO  |
| CR New Line Mode               | STD   | STD | NO  |
| Tilt and Swivel CRT            | STD   | STD | NO  |
| User Programmable Non-         |       |     |     |
| Volatile Answerback, 32 Code   | s STO | STD | NO  |
| Screen Brightness Control      |       |     |     |
| from Keyboard                  | STD   | STD | NO  |
| XON/XOFF Flow Control,         |       |     |     |
| Split for Xmitter and Receiver | STD   | STD | ND  |
|                                |       |     |     |

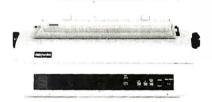
|                               | List Price Our Price 2 or More |
|-------------------------------|--------------------------------|
| BNVSL330GN Green Screen 12"   | \$1200.00 \$1050.00 \$ 995.00  |
| BNVSL33014GN Green Screen 14" | \$1250.00 \$1095.00 \$1050.00  |

The VSL300 contains all of the same specifications as the 330 but with no multi-emulation capabilities. The VSL300 is ANSI X3.64 com-

BNYSL300GN Green Screen 12" \$1200.00 \$1050.00 \$995.00 BNYSL30014GN Green Screen 14" \$1250.00 \$1095.00 \$1050.00

# **LOW COST DAISYWRITER 2000** WITH 40 CPS EFFECTIVE SPEED **AND 48K BUFFER!**

ONLY \$1495.00!!



The SLMDW2000 may just be the best dollar value in a letter quality printer on the market today. Features include:

Effective printing speed raised from 16cps to 40cps by the intel-

- ligent interface 48K buffer memory
- Daisyplot Graphics
- Datsyllot Graphics Printwheel cassettes available in 12 styles and 15 languages Standard IBM ribbon cartridges MTBF of 4000 hours at 25% duty cycle

This printer is DIP switch selectable for its personality protocols. This eliminates the need to replace a printer when the computer system is expanded, modified or adding additional printers that must be compatible with existing hardware and software. Included among the protocols that can be emulated are:

• NEC 5510 • DIABLO 630 • QUME Sprint 9

• IBM Personal Computer • ATARI (Centronics 737)

- RS232C and Current Loop Centronics type parallel interface IEEE/488 All are DIP switch selectable

SPECIAL FEATURES:

280 CPU • 12K ROM • Standard 48K Buffer • 16 Softwareor hardware selectable baud rates 50 - 19.2K baud • Micro-coded alarm differentiates error conditions with pulse combinations • Intelligent bidirectional printing with logic seeking • Complete word processing features, standard • Complete self test • Auto reprint up to 255 times • Auto clear error - printer automatically resumes printing upon correction of ribbon, paper or cover open conditions • Proportional spacing • Supports Automatic justification • Complete Vector plotting routines • Sheet feeder mode - allows easy interface to most mechanical sheet feeders • Quite- 60db • Front panel forms control Universal power supply 115/220.V 50/60Hz

Description List Price Our Price Part No.

BNSLMDW2000 Printer with 48K buffer \$1595.00 **\$1495.00 \$ 125.00** BNSLMDWVFT Vertical Form Tractor Pre-configured cables are available. Please call for price and part number.

PRIORITY ONE ELECTRONICS







ORDER TOLL FREE (800) 423-5922 - CA, AK, HI CALL (213) 709-5111
Terms. U. S VISA M C. BAC, Check Money Order, U.S. Funds Only. CA residents add 61/4% Sale Tax. MINIMUM PREPAID ORDER \$15.00. Include MINIMUM SHIPPING & HANDLING of \$3.00 for the first 3 lbs. plus 40¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through February, 1983. Credit Card orders will be charged appro-priate freight. If you haven't received your Winter '83 Engineering Selection Guide, send \$1.00 for your copy today! Sale prices for prepaid orders only.



# S-100 DUAL 8" SUBSYSTEM

BNCCS2422A BNSIEF001008 BNIIIFDE002

S-100 Disk Controller with CP/M 2.2 Siemens Double Denisty 8" drive Dual Horizontal Cabinet with Power Supply and Data Cable

\$ 35.00 \$1227.00 SAVE \$232.00!!

**DON'T** 

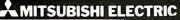
Order No. BNPDBSIESUB1

\$498.00

\$295.00



# OUR BEST DRIVES **BEST CABINET!!**



WITH THE



**Better Than** OUME! **Better Than** SHUGART!

nsity, interchangeable with QUME & Shugart Shipping Weight 16 lbs. \$450.00 \$ 10.00

2 or More: \$435.00 each



# **DUAL 8" FLOPPY DRIVE CABINET**

- Positive Pressure Filter Cooling
   Power Supply:4A@+5V,3A@+24V
- Hinged top for easy access
   Heavy non-flex .090 alumin
- · Each output is individually fused

TWO MITSUBISHI 8" DRIVES DOUBLE SIDED DOUBLE DENSITY CABINET TOGETHER!!!

BNPDBMITFDE BNPDBMITFDEEM\* Same as above with disk environ- \$1230.00

DRIVES AND CABINET SHIPPED SEPARATELY



Exactly one-half the height of any other model proprietary, high-resolution, read-write heads patented by Tandon D.C. only operation - no A.C. required

Industry standard interface

Three millisecond track-to-track access time (9 lbs.) BNTNDTM8481 Single Sided: \$380.00 2 or more: \$370.00 ea.

Double Sided: \$495.00 2 or more: \$485.00 ea. BNTNNTM8482

TANDON 51/4" DRIVES

BNTNDTM1001 \$220.00 ea. Single Sided, 250KB (5 lbs.)

2 or More: \$200.00 each

BNTNDTM1002 Double Sided, 500KB \$295.00 ea.

2 or More: \$270.00 each BNTNDTM1003 Single Sided, 500KB

\$295.00 ea. 2 or More: \$270.00 each

Double Sided, 1000KB \$395.00 ea. BNTNDTM1004

2 or More: \$375.00 each



# **DUAL THIN LINE** CABINET by TMR

- Fan cooled
- 24V @ 4 A/5A • 5V @ 2A
- Scratch resistant

Baked Enamel Finish

List Price Our Price BNJMRTLC Cabinet & Power Supply \$200.00 \$180.00

# (Shipping Weight 12 lbs.) **BUY THE CABINET AND DRIVES TOGETHER:**

BNPOBJMRTNO1 w/two TNDTM8481s (30 lbs.) \$920.00 RNPORJIMATNO2 w/two TNDTM8482s (30 lbs.) \$1150.00 Includes Power Cables

51/4" DISK DRIVE CABINETS JMR Single 51/4" Drive Cabinet BNJMR1C5

(5V @ t A, 12V @ 1.5A) Sh. Wt. 5 lbs BNVIS9802 Vista Dual 51/4" Drive Cabinet (+5V @ 2A. 12V@3A) Sh. Wt. 9 lbs.

\$ 79.00 \$110.00



Positive Pressure Filter Cooling

 Power Supply:4A@+5V,3A@+24V 1A@-5V

Each output is individually fused

Heavy non-flex .090 alumin

Modular power connectors

# **BUY DRIVES AND CABINET** TOGETHER AND \$AVE!!

DUAL 8" SIEMENS FD01008, **DUAL 8" CABINET POWER SUPPLY** AND INTERNAL POWER CABLES

IF BOUGHT SEPARATELY: \$910.00

PRICED AT: RNPORHISIE

# **ENVIRONMENT MONITOR PANEL**

Temperature and voltage monitor with visual and audible alarm for overtemp condition. Direct Digital Readout ot Internal temperature in C° on standard DVM

CABINET ONLY (Sh. Wt. 38 lbs.) RNIIIENENN2 BNPDBIIISIEEM 2-Drives, Cabinet & disk environment monitor BNIIIFDE002EM Cabinet only with disk environment monitor BNPGC5DM18E18E Dual Internal Data Cable \$375.00 BNPGC50S60S External Data Cable \$19.77

# VISUAL 50

- Low profile detached keyboard features sculptured keys with matte finish
- Screen tilts and swivels 80 x 24 display with 25th
- status line 7 x 9 dot matrix with full decenders
- BS-232 Serial interface w/auxillary RS-232 port
- 128 Character ASCII set and 31 character line drawing set

# INTRODUCTORY OFFER!!

BNVSL50BW Non-glare Black & White List: \$695.00 Our Price: \$650.00 BNVSL5DGN P31 greendisplay List: \$750.00 Our Price: \$685.00 (Shipping Weight 37 lbs.)



51/4" DISK DRIVES Single-Sided Double-Density 48 TPI

\$200.00 RNMPI51\* RNMPI52\* Double-Sided Double-Density 48 TPI \$270.00 BNMPI91\* Single-Sided Double Density 96 TPI \$275.00 BNMP192\* Double-Sided Double-Density 96 TPI \$400.00 \*" when order, with "m" for MPI style bezel, or \*Replace

"\$" for Shugart style bezel. (Shipping weight: 5 lbs.)

# 2" HIGH 8" DISK DRIVES



The first 2" high 8" disk drive allows for mounting under the keyboard on CRT, etc.

NO AC Required +5V +24VDC only FAST 3 msec track to track!

\$760.00

\$920.00

\$380.00 BNMPI41M Y2 High 1 side double-denisty 1/2 High 2 side double-density
Full height 1 side single drive, dble.-density RNMPI42M \$460.00 BNMPI41S \$380.00 Full height 2 sided single drive, dble-density \$460.00

RNMPI41 N Full height 1 side dual drive, dble.-density RNMP142D Full height 2 sided dual drive, dble-density

(Shipping Weight: 11 lbs. per drive)

# **5" DISKETTES**



SOFT SECTOR 40 TRACK SINGLE SIDED DOUBLE DENSITY WITH HUB REINFORCING RINGS

Package of 10: \$19.95

**BONUS!** 



BNPRI58D package of 80. less Library Case \$120.00

# **EIA/RS232 WALL PLATES**

(Does not include connectors) BNIIIWPDB251 Single punched

4/\$10.00

BNIIIWPDB252 Dual Punched

4/\$12.00



# RS-232 "D" SUB-MINIATURE **CONNECTORS**

|              |                    | 1-9    | 10-24  | 25-99  | 100-UP |
|--------------|--------------------|--------|--------|--------|--------|
| BNCNDDB25P   | 25 Pin Male        | \$2.75 | \$2.50 | \$2.25 | \$1.95 |
| BNCNDDB25S   | 25 Pin Female      | \$4.00 | \$3.50 | \$3.25 | \$3.00 |
| BNCNDDB51212 | 1 Pc. Grey Hood    | \$1.65 | \$1.40 | \$1.25 | \$1.15 |
| BNCNDP25H    | 2 Pc. Grey Hood    | \$1.50 | \$1.25 | \$1.10 | \$1.00 |
| BNCNODB51226 | 2 Pc. Black Hood   | \$1.75 | \$1.50 | \$1.35 | \$1.20 |
| BNCNDD20418  | Hardware set 2/Pr. | \$1.00 | \$ .80 | \$ .70 | \$ .60 |

# (か)Texas Instruments 16 PIN GOLD AND TIN **DIP SOLDERTAIL SOCKETS**



TIN BNTIS16LP BNTIG16LP 8.00 \$ 10.00 50 \$ 60.00 \$ 80.00 1000 4500 \$225.00 \$315.00

# 1200 BAUD AUTO-DIAL HAYES SMARTMODEM COMPATIBLE

**U.S. ROBOTICS MODEMS** 

modem capable of dialing and calling for you. The AUTO DIAL 212A is MARTMODEM"

| mhannie in | lunction to the Do Raye. |
|------------|--------------------------|
| rt No      | Description              |

List SALE Price





# ACQUSTIC MODEN

The PHONE LINK Modem is a 300 baud RS232 compatible acoustic ble of operating as either an answer or originate modem. It is BELL 103/113 compatible and will accept most standard phone

BNUSRPLNK 0-300 Baud acoustic modem

\$149.00 \$129.00

# MICRO LINK DIRECT CONNECT MODEMS

BNUSRMLNK300 0-300 baud direct connect \$179.00 \$159.00 BNUSRMLNK1200 1200 baud direct connect \$449.00 \$399.00

# **AUTO LINK DIRECT CONNECT AUTO ANSWER MODEMS**

BNUSRALNK300 0-300 baud auto/direct connect \$219.00 \$195.00 BNUSRALNK1200 1200 baud auto/direct connect \$499.00 \$449.00 BNUSRALNK212A 0-300, 1200 baud auto/direct \$549.00 \$475.00

| U <sub>SAAO1A</sub><br>Specs  | SRALAKE<br>2124 | SRALWA) | SRMINA<br>200 | ISRAINK. | USAMIN. | 300 | 244 |
|-------------------------------|-----------------|---------|---------------|----------|---------|-----|-----|
| 1200 Baud                     | X               | X       | X             | X        |         |     |     |
| 0-300 Baud                    | X               | X       |               |          | X       | X   | X   |
| Auto Dial                     | X               | 8       |               |          |         |     |     |
| (Hayes Smartmodem compatible) |                 |         |               |          |         |     |     |
| Auto Answer                   | X               | X       | X             |          | X       |     |     |
| Auto Mode Select              | X               |         |               |          | X       | X   |     |
| DTR Override                  | X               | X       | X             | X        | X       | X   |     |
| RS232 pins 2&3                | X               | X       | X             | X        | X       | X   |     |
| reversible                    |                 |         |               |          |         |     |     |
| LEO Indicators:               | X               | X       | X             | X        | X       | X   | X   |
| Carrier Detect                | X               | X       | X             | X        | X       | X   | X   |
| Analog Loopback/<br>Self Test | X               | X       | X             | X        | X       | X   | X   |
| Send Data                     | X               | X       | X             | X        | X       | X   | X   |
| Receive Data                  | X               | X       | X             | X        | X       | X   | X   |
| Terminal Ready                | X               | X       | X             |          | X       |     |     |
| Off Hook                      | . Х             | X       | X             |          | X       |     |     |
| Answer Mode                   | X               | X       | X             |          | X       |     |     |
| Ring Indicate                 |                 |         | X             |          | X       |     |     |
| High Speed                    | X               | X       |               |          |         |     |     |

# COMPLETE COMPUPPO SYSTEMS FREE SUPERCALC-86! FREE dBASEII!! AND A TELEVIDEO 910 TERMINAL FOR ONLY \$1.00!

**SYSTEM 816/A** ENTRY LEVEL SINGLE-USER SYSTEM

System 816/A is an excellent choice for an entry level, single user system that's designed with future System of the state of the stat (clock calendar, RAM/ROM/match processor options, RS-232C serial port, interrupt controllers, interval timers, and more), and Ashton-Tate's dBase Junior™, an upgradeable subset of their popular dBase II data base management software. This combination of components means superb computing today with an option for future expansion — all the way up to a multi-user system. System 816/A is priced at \$5495,00, a savings of over \$1000.00 compared to all components purchased separately

Single User System Desk Top, A&T BNGBTSYS816ADC Single User System Desk Top. 200 hr. Burn-in

COST

**PRINTER** 

AVAILABLE

\$6345.00

For More Details. See Page 215

of the January

Issue of BYTE

\$5495.00

BNTLV910 TeleVideo 910 Black& White w/purchase of above system

**LOWEST** 

# **DATAGARD**



LINE MONITOR POWER **CONDITIONERS** 

Before you plug in your computer, you'd better consider how you are going to insure or protect your investment from unwanted electrical

### **DG115 SERIES** SINGLE STAGE SPIKE PROTECTION

| Part No.    | Description          | Wt.    | List    | SALE    |
|-------------|----------------------|--------|---------|---------|
| BNWBROG115P | Wall unit plug in    | 2 lbs. | \$49.95 | \$34.95 |
| BNWBROG115S | 6 outlet strip w/SW< | 3 lbs. | \$61.95 | \$42.00 |

# **DG315 SERIES**

# 3 STAGE SPIKE FILTER AND FOUR STAGE NOISE FILTER

| BNWBRDG315P | Wall unit plug in    | 2 lbs.\$153.95 \$ 99.95 |
|-------------|----------------------|-------------------------|
| BNWBROG315S | 6 outlet strip w/SW< | 3 lbs.\$193.95 \$119.95 |
| BNWBRDG315R | 6 outlet racksw/SW<  | 8 lbs.\$193.00 \$119.95 |



# **Z-80 BEGINNER KIT** Z80 CPU - 2 S-100 **EXPANSION SLOTS**

- 780 CPII 2 S-100 slots for expansion
- · Wire wrap area for custom circuitry On board keyboard and display
- Cassette interface for mass storage 2K RAM included
- 4K ROM (not included)
- RS232 port 300-19.2K baud
- Comes with ZBUG Monitor on ROM BNQTCTBASIC \$25.00

with SID driver routines TINY BASIC available



BNOTCZ80BEGA LIST PRICE: \$400.00 SALE PRICE:

\$340.00

(Shipping weight 4 lbs) TINY BASIC ROM:

PRIORITY

5 x 7 Dot Matrix • Parallel Interface

(Centronics) • Tractor Feed • Dot Addressable Graphics . Up to 3-Part Paper . Self

Test • One Year Warranty • 30 CPS 80 Column Unidrectional • Uses Regular Paper

BNAXMGP100A (Shipping Weight 11 lbs.)

List Price: \$389.00

ONE

\$229.00

**ELECTRONICS** 





9161 DEERING AVE ● CHATSWORTH, CA 91311 NEG

ORDER TOLL FREE (800) 423-5922 - CA, AK, HI CALL (213) 709-5111
Terms U.S. WSA, MC. BAC. Check, Money Order, U.S. Funds Only, CAresidents add 612% Sales Tax. MINIMUM PREPAID ORDER\$15.00. Include MINIMUM SHIPPING & HANDLING of \$3.00 for the first 3 lbs. plus 40¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through February, 1983. Credit Card orders will be charged appropriate the change of the c riate freight. If you haven't received your Winter '83 Engineering Selection guide, send \$1.00 for your copy today! Sale prices for prepaid orders only.



# HITACHI DUAL TRACE OSCILLOSCOPES ALL HITACHI DUAL TRACE SCOPES ARE SHIPPED COMPLETE

V-203F

WITH 2 PROBES AND INSTRUCTION MANUAL.

V-353F



V-352F

BNHITV352F

# 35 MHz **DELAYED SWEEP**

 Single time base delay sweep ● rectangular CRT with internal graticule
 High sensitivity 1 mv/div (7MHz) Large dynamic range of 8 div to full bandwidth • CH1 output • Built-in signal delay line BNHITV353F List: \$949 00

SALE: \$799.00

35 MHz DUAL TRACE

List: \$895.00 SALE: \$749.00

List: \$695.00 SALE: \$575.00 RNHITV202F

V-302F



# 30 MHz **DUAL TRACE**

 High sensitivity 1mv/div (5 MHz) 
 High sensitivity 1mv/div (5 MHz) 
 CHI TV Triggering 
 X-Y operation 
 CH 1 Output 
 Built-in signal delay line 
 High reliability. MTRF 20 000 hours High reliability, MTBF 20,000 hours BNH1TV302F List: \$799.00

SALE: \$699.00

V-202F 20 MHz DUAL TRACE

List: \$749.00

20 MHz

**DELAYED SWEEP** 

• Singletime basedelay sweep • High sensitivity 1mv/div (5MHz) • Full TV triggering • X-Y operation • CH1

Output . High reliability, MTBF 20,000

SALE: \$625.00

V-152F 15 MHz DUAL TRACE Same as V302F except without delay line and only 15MHz

RNHITV152F

**VIEWPOINT 3A+- ADDS** 

Detachable keyboard, RS232 interface and auxillary port, 80 x 24 display with 5 x 7 dot matrix, tiltable 12"

BNAODYWPR Sh. Wt.30 lbs. List:\$699.00 OUR PRICE: \$525.00 S-100 BOARDS

M22

DUAL

QT COMPUTER

CALIFORNIA COMPUTER

Floppy disk controller w/CP/M

Introducing Solo, a new cost-effective solution to Apple Disk Storage, offering all the capabilities of the standard Apple Disk II at a

VISTA 3101 DISK DRIVE WITH APPLE II CONTROLLER

(Shipping Weight 6 lbs.)

Z80A SBC Beginner Kit A&T S-100 SBC A&T

32K CMOS Memory Card 2716 EPROM Board

**COMPARE PRICES!** 

ADDS Applied Digital Data Systems Inc.

Description

BNSSMIOBA 108 Eight Serial 1/0 2 Parallel. 2 Serial I/O

BNSSMVB3A24 80 x 24 Video Board

RNDIII CPIIGROOD 68000 S-100 CPIE BNDULDMEM256K 256K Dynamic Memory Card

BNSSMPB1A 2708/2716 Programmer & EPROM 105 Input/Cutput

SIO4-DMA

Clock Calendar

Z80A CPU w/RS232

2 Serial, 2 Centronics Par.

4 Port Serial I/O

4 Port Parallel I/O

6 Port Serial I/O

SALE!

\$525.00

Part No.

BNDIII CMFM32

BNDULS104BMA

RNOTCZROREGA

BNOTCCCSA

BNCCS2810A

BNCCS271901

BNCCS272001

BNCCS273001

BNCCS2422A

List: \$595.00 SALE: \$495.00

List Our Price

\$265.00 \$219.89 \$329.00 \$289.89 \$550.00 \$469.89 \$290.00 \$249.89 \$499.00 \$440.00

\$895.00 **\$850.00** \$1295.00 **\$1230.00** \$695.00 **\$660.00** \$295.00 **\$280.00** \$695.00 **\$650.00** 

\$400.00 **\$360.00** \$325.00 **\$295.00** \$165.00 **\$150.00** 

\$325.00 \$289.89 \$325.00 \$310.00 \$360.00 \$345.00 \$275.00 \$265.00 \$550.00 \$525.00

\$425.00 \$399.00

SOLO

# 64K IEEE/S-100 DYNAMIC

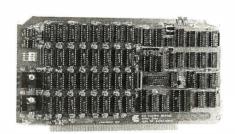


# 2 or 4MHz BANK SELECTABLE

• 2 or 4 MHz operation • Designed to IEEE proposed S-100 tus standards • Supports MSAH-type front panels • Operates with either an 8080 or Z-80 based S-100 system providing processor transparent refresses with both • Bank-select system allows system memory expansion • Bank-select port's address is jumper selectable • Any 16 K block can be made bank-independent • All 64 K can be made bank-independent • All 16 K can be made bank-independent on power on and reset • Fully buffered address and data lines • Configuration as a on and reset • Fully buffered address and data lines • Configuration as a IGK. 32K or 48k board without the removal or RAMs • Fail-safe refresh circuitry for extended Wait States • Board configuration with reliable, easy to configure Berg jumpers • Supports DMA • Jumper-selectable Phantom input • Assembled & Tested • All ICs in sockets • Uses Popular 4116 RAMs • Full factory warranty.

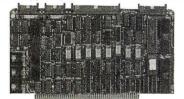
REGULAR LIST PRICE IS \$375.00

# **YOU SAVE AN** INCREDIBLE \$176.00!!



\$199.00

# SIERRA DATA SCIENCES



MICROPOLIS'



# **BEST OF BOTH WORLDS!** PERFORMANCE AND LOW COST!

Flonny Disk Interface Controls Four 8" or 5\%" Drives • 35 Mbytes of mass storage • CP/M 2.2 with the Sierra Data Menu Driven BIOS Winchester Hard Disk Adaptor
 Disk Drive Power Supply and Cabinet ● Drive Data Cable ● S-100 IEEE Compatible

CONTAINS

BNSOSSBC SBC Computer \$850.00 BNSOSHOI Hard Disk Cont. \$150.00 BNSOSWNMCP Disk Cab & P.S.\$495.00 RNMCPI2231 35 Mbyte

Hard Disk BNSDSCPM CP/M 2.2 w/BIOS \$150.00

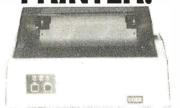
(Shipped in 5 boxes, total Sh. Wt: 81 lbs.)

\$5240.00

TOTAL **PACKAGE** PRICE: \$3595.00 \$150.00 \$4795.00

SAVE \$445.00!!

# COEX 80 F/T LOW COST, **DOT MATRIX**



format control . Centronics parallel or RS232 serial interface . Use a standard Underwood spooled ribbon . Friction and tractor feed.

BNCOXBOFT BNCOX80FTSER

List Price Our Price \$399.00 Parallel int. \$329.00 \$399.00 \$329.00 Serial int

SALE PRICE:

(Shipping Weight 21 lbs.)

ONE

# **ELECTRONICS**

fraction of the cost!

**DISK DRIVE** 

Cost effective

35 track drive

Totally Apple II compatible

143K bytes of storage

BNVIS3101 Apple drive add-on

BNVIS311 Drive with controller

120 day warranty

APPLE



Circle 342 on inquiry card.

\$269.00



List Price SALE

\$299.00 \$269.00

\$379.00 \$349.00

9161 DEERING AVE • CHATSWORTH, CA 91311

ORDER TOLL FREE (800) 423-5922 - CA, AK, HI CALL (213) 709-5111
Terms. U.S. VISA, MC, BAC, Check, Money Order. U.S. Funds Only. CA residents add 612% Sales Tax MINIMUM PREPAID ORDER \$15.00. Include MINIMUM SHIPPING & HANDLING of \$3.00 for the first 3 lbs. plus 40¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your

phone number Prices subject to change without notice. We will do our best to maintain prices through February, 1983. Credit Card orders will be charged appropriate freight. If you haven't received your Winter '83 Engineering Selection guide, send \$1,00 for your copy today! Sale prices for prepaid orders only

# PRINTER!



80 cps 10, 12 or 16.5 cpi 3 selectable line spacing Vertical

V54

List Price: \$399.00

PRIORITY |

524

BYTE February 1983

# **Unclassified Ads**

FOR SALE: Sinclair ZXB1 computer complete with 16K memory module and Financial Program package, used for only one week, \$110. Joe Bryan, 1607 Limestone Court, Montgomery, AL 36117, [205] 272-0754.

FOR SALE: IBM Selectric terminal from the IBM Saber system converted to an uppercase and lowercase printer. \$200 buys printer, interface and driver for H-B, driver listing, and schematics needed to interface to other microcomputers. Tom Golway, [212] 735-2935. Monday through Friday between 9.30 a.m.-4:30 p.m.

FOR SALE: Heathkit H-14 printer with 40,80,96, and 132 columns. Selectable bps rate 110, 9600. Letter quality. RS-232C interface: \$290. Jim Brooks, 3343 Grand River Dr., Grand Rapids, MI 49505, (616) 363-2660.

WANTED: Hardware information, service manuals, circuit diagrams, etc., for aging Wang 22008 computer: any or all peripherals and any information concerning add-on ROMs. Am also interested in reasonably priced peripherals for same. Will gladly pay for photocopies, etc., but please contact me first to avoid duplication. Phil Sutherland, POB 177, Nedlands, Western Australia 6009, or phone international + 61 9 386 4859 during office hours here (0100 to 0900 GMT).

FOR SALE: North Star floating-point board. Unused, due to incompatibility with FORTRAN compiler. Lists at \$399, will sell for \$250 or best offer. Mike Modest, 12651 Windward Ave., Los Angeles, CA 90066. [213] 397-4836.

WANTED: Your help bringing microcomputing awareness to rural Minnesotans. East Central Regional Library [ECRL] Computer fund raises funds to place microcomputers and educational software in rural libraries for use by general public free of charge. Send tax-deductible contributions to ECRL Computer Fund, Attn: D. L. Deye MD. Cambridge Clinic, 626 South West 7th Ave., Cambridge, MN 55008.

FOR SALE: Apple Silentype thermal printer with interface card and connecting cable. Driven by little old lady to church on Sundays. Excellent condition. Free with purchase: one well-used but interpretable manual. Asking \$425 US funds. Response guaranteed. Erik Sea. 22 Edgar Dr., London, Ontario, N&G IKI Canada.

FOR SALE: 54 disks of games! Complete personal collection of over 1,000 arcade, adventure, educational, space, etc. Will sell only as a unit for \$850. One of a kind. E. Abrams, 6400 Hayes St., Hollywood, FL 33024, [305] 987-6889.

•FOR SALE: New TRS-80 Model III with 48K, two disk drives, serial port, Scripsit Word Processor and parallel cable; best offer. Spectrum Soft Sector 5¼-inch floppy disks, excellent quality; they will work in Apple, TRS-80, and many others: \$2.50 each plus sufficient first-class postage. J. Browning, 3616 Crest SE, Albuquerque, NM 87108.

WANTED: Apple II with 16K of memory or Osborne I personal computer in exchange for full tax write-off. A professional, fully registered, nonprofit theatre needs a small business computer for budget planning and control needs. Word processing and printing capabilities are not essential. Your donation is tax-deductible. David Lemos. Producing Director. San Jose Repertory Company, POB 9584, San Jose, CA 95157, [408] 294-7572.

ATARI USERS: I am currently interested in hearing from other Atari users around the states to start a users group and put out a newsletter. If you have anything to contribute to the first issue please send it to me. I am also looking for software to trade. John Conley, II Sunnyside Rd., Scotia, NY 12302.

FOR SALE: Attention homebrewers I am selling many ICs and other components. Most of these ICs are memory. LSI interface, and many 7400 TTL, also some 4000 CMOS. All at low prices and guaranteed. Most are new and unused. Send SASE for a list and prices. Kevin Lovelace, 5500 Sonora Dr., North Little Rock, AR 72118.

FOR SALE: Eaton LRC 7000 + printer with manual, three new rbbons, and cable. Excellent condition. \$150. John C. Daoust. 103A East 23rd St., Texarkana, AR 75502, [501] 774-1340 after 5 p.m.

FOR SALE: Lobo Model 1850 hard disk for Apple II Plus computer. Includes in one package: 10-megabyte fixed 8-inch disk, 1.2-megabyte 8-inch floppy disk, power supply. and controller card. Brand-new condition, 6 months remaining on factory warranty: \$3000. Ray Krauss, 3478 East Jamison Ave., Littleton, CO 80122, [303] 694-1931.

FOR TRADE: Software for Timex and/or Sinclair computers with 16K RAM. I have a collection of games and utilities which I would be interested in swapping for programs of equal value. They are available on cassette or in listing form. Chris Collins, 485 Willowtree Dr.. Melbourne, FL 32935.

**WANTED:** Manual for TDL/Xitan text editor. Will pay cost of duplicating. Lloyd Larson, 38236 Sheridan Rd., Waukegan, IL 60087, [312] 244-4943, evenings: 882-3777, days.

FOR SALE: DEC M8059-KF 128K-word (16 bit with panty) memory card for O-bus (LSI-11). Brand new in original box: manufactured April 1982. DEC list price: \$2834 with 12-month delivery. Uses Hiachi 4164s. Asking \$2000, price negotiable. Michael Blyler, Georgia Tech Box 32380, Atlanta. GA 30332, 14041 874-4987.

FOR SALE: New multi-user North Star Horizon with 256K bytes of memory. 18-megabyte hard disk, one quad drive, one HSIO board, and processor. Reasonably priced below wholesale. Drop a card with quote and I will call you. A. I., 74 Lincoln St., Jersey City, NJ 07307, [201] 659-0836.

FOR SALE: Exidy Sorcerer 32K, 8K BASIC pak, several games, computer instruction book. 3550 or best offer. Development pak: 560. 64K Netronics memory board without memory (4116): \$100. Heathkit ET-3400 trainer and course: \$195. Would consider trade on any of the above for 8-inch disk drives or CP/IM software. Nelson Lewis. 1005 Don Rovin Ln., Farmington, NM 87401, [505] 325-5426 evenings.

WANTED: CP/M software. Well-established nonprofit corporation seeks tax-deductible contributions of new and used CP/M software. Will furnish certified receipts. Philadelphia Festival Chorus, Suite 4310, 1500 Locust St. Philadelphia, PA 19102.

FOR SALE: Ball transistor-transistor logic 12-inch black-and-white monitors, little use, ready to plug into Osborne 1. Money back if not fully satisfied: \$125 (\$130 with manual and schematic) plus UPS shipping charges. Also, I want a biorhythm program on 514-inch floppy disk for CP/IM operating system. Lew Yeager, 728 Seventh St., Marietta OH 45750, [614] 373-6501.

FOR SALE: Heath H-89 with single 5¼-inch floppy disk and H-14 printer; best offer. Xerox dual 8-inch single-sided disk drives, new: \$1395. Sencore CB-42 analyst: best offer. Sams CB-1 through CB-125; best offer. Heathkit S8-300 and SB-401 complete with manuals; best offer. Stan Stevens, RR4 Box 26, lowa City, IA 52240, [319] 354-9726.

**WANTED:** Collecting Apple II PLus one-line programs (up to five-liners) including utilities, graphic/sound routines, or illustrations of useful addresses in the Apple. If you wish a listing in return, please send a SASE with your one-liner or include a dollar (without a one-liner) to cover printing costs. James A. Sullivan, 2309 Glenn Court, Charlottesville, VA 22901.

FOR SALE: Two teletype Model 43 keyboard/printer. dotmatrix terminals, 30 cps RS-232C in mint condition, \$450 each. Also. Millenium universal in-cruit emulator with 6800 personality card, \$1500 [originally \$7000]. Ralph Guditz. 1951 Colony St., Mountain View. CA 94043, [415] 960-3462 after 10 p.m. PT. WANTED: TRS-80 Model I/III—compatible software to swap. I have a large library of programs to trade for anything ranging from utilities to arcade games. Send a list of your programs or a cassette or disk of your better programs and I will promptly return the same. Ron Katcher, 13843 North 51st St., Scottsdale, AZ 85254, [602] 996-5454.

FOR SALE: Ohio Scientific C4P Series 2; BK RAM and BK ROM; color graphics. Includes full schematics and instruction manuals. Used less than 500 hours. Paid \$1600 for computer and Amdek color monitor. \$1250 firm. I will pay shipping. Orpheus Allison. POB 387, Mapleton, ME 04757.

FOR SALE: 48K Apple II Plus computer with radio-frequency modulator and tape recorder. Lots of software plus all manuals and demonstration programs: 5900. Geoff Emerson, 3 Spaulding Court. Saugerties, NY 12477. (914) 246-9770.

FOR SALE: OSI C.I.P. with 8K RAM, 32/64 video modification, new ROMs, RS-32C port, dual joysticks, and sound port. Good condition: \$375 or best offer. Also, Micro Communication Corp. digital tape drive and nine 50-foot tapes (similar to Exatron Stringy/ Floppy), barely touched: \$125. Send SASE. Michael McInerny, 75 Coachman Dr., Penfield, NY 14526.

FOR SALE: Cromemco Z-2 with dual B-inch floppy disks. 128K bytes of memory, digital-to-analog and TV Dazzler boards. two joysticks. SOROC IO 120 terminal, and GE Terminet 300 printer. Software: FORTRAN. assembly, Database. Word Processing. BASIC. Dazzler games and graphics. USP, and Ratfor. Originally \$8000, asking \$3600. P. Baum. 11410 Lombardy Lane. Sunnymead. CA 92388.

**WANTED:** Broken or unwanted computers, printers, and other peripherals. I am a high school student, but will payfor shipping and handling. Greg Ham, 4048 Southwest 8th St., Plantation, FL 33317, J305, 792-4204.

FOR TRADE: One or more new Xerox 820 computer systems with dual 8-inch disk drives (retail \$3900 each) and/or one or more Xerox #400 Telecopiers (retail \$1695 each). We need three letter-quality printers of 40 cps or better: also a Televideo display and keyboard: and/or a hard-disk system to link with our Altos 8000 processor. Call if you are interested in bartering! Mary Lombardi, 547 Mission Vineyard Rd., San Juan Bautista, CA 95045, [408] 623-4576.

FOR SALE: PET 2001 with 24K bytes of memory [8K plus 16K expansion]. Can insert additional 16K in memory-expansion board. Commodore 2040 dual-disk drive. One built-in cassette drive and added full-sized keyboard. All manuals included: \$975. Neil Omwedt, 3036 Asbury St. Roseville. MN 55113, [612] 633-5743.

FOR SALE: Apple III including black-and-white monitor and additional disk drive. Also, Pascal, Visicalc, and Business BASIC software packages. Less than one year old and in perfect condition. \$4000. R. Michael Tague, 200 Don Allen Rd., Louisville, KY 40207, [502] 895-4508.

WANTED: User manual, schematics, etc., for Compu/Time CT-IO0-1 calculator and digital clock S-IO0 board. I will pay reasonable reproduction and mailing costs. Jim Wolfe, POB 6601. Torrance, C A 90504, [213] 376-2931.

FOR SALE: NEC 12-inch monitor and Microsoft 16K RAM card, unused, new: \$100 each or best offer. A. Morton, 1340 Laffer Ave., Akron, OH 44305, [216] 784-9697.

**UNCLASSIFIED POLICY:** Readers who have computer equipment to buy, sell, or trade or who are requesting or giving advice may send a notice to BYTE for inclusion in the Unclassified Ads section. To be considered for publication, an advertisement must be noncommercial (individuals or bona fide computer clubs only), typed double-spaced on plain white paper, contain 75 words or fewer, and include complete name and address. This service is free of charge; notices are printed once only as space permits. Your confirmation of placement is appearance in an issue of BYTE as we engage in no correspondence. Please allow at least three months for your ad to appear. Send your notices to Unclassified Ads, BYTE/McGraw-Hill, POB 372, Hancock, NH 03449.

# **Unclassified Ads**

FOR SALE: Ohio Scientific Challenger 4P color computer, Excellent condition with Quasar solid-state black-and-white converted TV/monitor and cassette recorder. Includes all manuals and OSI home-taped programs: \$550 or best offer. Barry Sitek, 140 Morningside Ave., Park Ridge, NJ 07656, [201] 391-6015.

**ADVICE NEEDED:** I have an 8085-based homebrew and I would like to implement a BASIC interpreter. I will buy or swap parts or ideas. I have many homebrew microcomputer circuits. B. Shaffe, 98 Onieda Ave., Centereach, NY 11720.

FOR SALE: TRS-80 ModelIII 48K with disk drive: \$1550, only 4 months old. Leave a message and I will call back. Robert Linza, (713) 332-7480.

FOR SALE: 3-year-old TRS-80 with four disk drives, high-speed daisy-wheel printer with optional tractorfeed, RS-232C, uppercase lowercase adapter, data separator, 64K Omikron Mapper with CP/M. Excellent condition. Software includes Scripsit, Script, Chextext, NEWDOS, NEWDOS-BO, TRSDOS, CP/M-22, C-BASIC. MBASIC-80, Wordstar, BASIC Compiler, TDAM, Sort-Merge, AIDS III, and much more. New cost was \$11,000 asking \$4675. Tom Hamilton, 1998 Collingswood Rd., Columbus, OH 43221, (614)

FOR SALE: S-100 boards in working condition: 16K North Star RAM for \$225, 16K Memory Merchant static RAM for \$150, 16K CCS Model 2116C static RAM for \$225. Morrow Switchboard for \$200. SSM 104-2 parallel, 2 serial I/O for \$225. R. E. Clark, 712 South Ninth, Memphis, TX 79245, [806] 259-2232 after 8 p.m.

WANTED: Wang 2200 SVP-BB, MB DSDD disk, two MB fixed disks, 2236 DE interactive terminal, and 2235 matrix printer. Joe Showers, 1315 North Union St., Wilmington, DE 19806, (302) 655-6224, collect during day.

WANTED: Used S-100 computer for college student. I will accept any excess you have: drives, mainframe, memory, etc. I will send my 5-year-old stamp collection as a donation toward a running disk system. Call before sending. Tom Knox. POB 111305, Nashville, TN 37211, [615] 333-3627 after 5 p.m.

FOR SALE: Two 5¼-inch Shugart Model SA400 disk drives together in case with power supply; includes cables, manual, and dustcover: \$360. Also, one SEA-16 16K-byte memory board for KIM, SYM, AIM, or any KIM-4 bus machine: \$100. Both in mint condition. Tim J. Ingham, 2540 College Ave. #302, Berkeley, CA 94704, (415) 548-5370.

WANTED: Any learning information appreciated as I have access to a Hewlett-Packard 2647A and a SWT 6800 System with flex. Trying to learn while in prison. Stafford B. Bright, POB AE-1146, San Luis Obispo, CA 93409.

FOR SALE: KIM system: KIM-1: \$80, RCA keyboard: \$50, TVT-6 video board: \$25, TRS-80 video monitor: \$40, Econoram II-A BK RAM: \$80, Trendcom 100 printer with Apple interface: \$225. Complete computer system up and running, with all technical manuals, Tiny BASIC, assembler, and much additional software: \$400. Will sell all or part. Joel Aycock, POB 209, Kula. HI 96790, (808) 244-9108 (work).

WANTED: Used, working S-100 or multibus mainframe with motherboard and power supply, with or without cards. Also need wire-wrap boards for the above. David Langmann, 2900 Connecticut Ave. NW, Washington, DC 20008.

FOR SALE: Teletype Model 43 KSR, sprocket feed, with (internail 16K-byte Edge Technology Inc. Telebuffer-43 ASR. Excellent condition: \$1300. F. T. Grover, 8201 Hamilton Spring Court, Bethesda, MD 20817, (301) 365-0969.

**FOR SALE:** Word processor: Addressograph 425 with full-page 54-by-80 green monitor: letter-perfect Oume daisy-wheel printer and tractorfeed; dual 8-inch drive. Complete with mail merge, sort, select and arithmetic options, 150 floppy disks, and manual, Excellent condition, New \$9000, will sacrifice for \$4200. Soaring Bear, 2509 North Campbell, Tucson, AZ B5719, (602)

FOR SALE: Complete set of BYTE magazines. Over 80 issues from premier 1975 issue to latest issue (August 1976 missing). \$210 postpaid. Greg Aharonian, 307 Willow Ave., Ithaca, NY 14850, (607) 256-4940.

WANTED: Graduate student wishes to correspond with anyone interested in cognitive sciences. Looking for exchange of techniques, ideas, and opinions on topics such as artificial intelligence, languages (LISP, Logo, Planner, etc.), and psychology. I have background in psychology and programming, Conrad Sanford, 135 State St. 768-360, Auburn, NY 13021.

FOR TRADE: Apple owners! Send me a list of your software programs and I will send you mine. I am especially interested in recreational software. Please include a SASE, T. I. Chienroi, POB 855, Islington, MA 02090.

FOR SALE: Hewlett-Packard HP 41-C calculator, card reader. four memory modules, math and stat modules, and several application books: \$425. Dr. Alan Grant, 530 44th St., Brooklyn, NY 11220, (212) 436-1714.

FOR SALE: Software for the Apple II Plus. The Comptroller, General Business System, A/R, A/P, and G/L. Nate Brown, [717] 822-61B4.

FOR SALE: Exidy Sorcerer 32K-byte computer with BASIC ROM cartridge. Excellent condition, in original carton, with manuals, schematics, and two years of newsletter issues: \$590. Multibus interface for above, makes it Multibus Master: \$80 with cable. Intel 8086 University Kit, all the Integrated Circuits required to build an 8086 system (includes monitor in ROM), unused: \$90. Robot parts: two Slo-Syn 5.5V, 3.25-inch diameter, 50-ounce-inch torque steppermotors and platform for the above made of %-inch machined aluminum: \$95. Bill Georgiou, 6661 Berkshire Terrace #31, Goleta, CA 93117.

FOR SALE: Back issues of BYTE. August 1977 to December 1980. David Yost, 13329 Pearl Rd., Strongsville, OH 44136, (216) 238-0644 after noon.

# MPX a Winner

Readers of the November BYTE voted overwhelmingly for Steve Ciarcia's "Build the Circuit Cellar MPX-16 Computer System, Part 1." Ciarcia will receive the \$100 first-place award for his project on designing an 8088-based system than can run any peripheral device designed to be installed in the IBM Personal Computer. Second place goes to Peter Sørensen for "Tronic Imagery," in which he described the development of the computergenerated graphics in the movie Tron. He will receive \$50. Third place goes to Jerry Pournelle for his User's Column "Terminals, Keyboards, and How Software Piracy Will Bring Profits to Its Victims."

# **BOMB BYTE's Ongoing Monitor Box** Article # Page Article Author(s) The Lisa Computer System Build a Handheld LCD Terminal Apple's Enhanced Computer: The Apple Ile An Interview with Wayne Rosing, Bruce Williams 33 54 Ciarcia Moore

68 Daniels, and Larry Tesler The Enhanced VIC-20, Part 1: Adding a Reset Swank The World of Standards 6 130 Hill 146 Welcome to the Standards Jungle A Proposed Floppy-Disk Format Standard The Proposed ANSI BASIC Standard 8 182 Card 194 10 203 NAPLPS: A New Standard for Text and Graphics, Part 1: Introduction, History, and Structure 11 256 Realizing Graphics Standards for Microcomputers 272 The IEEE Standard for the S-100 Bus 12 The Scribble Text Processor 13 302 Problem Oriented Language, Part 3: 314 Assembling the Modules
User's Column: Confessions, Pascal Prime,
Wescon, and Perfect Writer 347 15 366 **LDOS Utilities** 

Shape-Table Graphics for the TRS-80

Passing Untyped Parameters in UCSD Pascal A Terminal Program for the TRS-80 Model III

Frezza Langhorst, Clarkson Garetz Kern

Morgan,

Williams. Lemmons

Card, Prigge,

Walkowicz,

Witten

Anderson Fleming,

Finger

Pournelle Daneliuk Rollins Willner **James** 

392

452

18

# Reader Service

| 88 COMPUADD 482 90 COMPUPRO/GODBOUT 105                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 108 COMPUTER PLUS 415 109 COMPUTER SOURCE INT'L. 126 110 COMPUTER SOURCE INT'L. 126 111 COMPUTER SOURCE INT'L. 126 112 COMPUTER SOURCE INT'L. 126 113 COMPUTER SOURCE INT'L. 126 114 COMPUTER SA MORE 459 115 COMPUTERS & MORE 459 116 COMPUTERS & MORE 459 117 COMPUTERS & MORE 459 117 COMPUTERS WHOLESALE 133 113 COMPUTERWARE 248, 249 116 COMPUTERWARE 248, 249 117 COMPUTERWARE 248, 249 118 CONTROL DATA 128, 129 119 CONSUMER COMP. 184 120 CONSULINK CORP. 9 121 CONTROL DATA 128, 129 121 CONTROL DATA 128, 129 122 CORTEX RESEARCH CORP. 494 123 COST PLUS COMP. 494 124 COUGAR MT. SOFTWARE 456, 459 125 CREATIVITY UNLTD. 494 126 CROMEMCO CI, 1 127 CROMEMCO CI, 1 127 CROMEMCO CI, 1 127 CROMEMCO CI, 1 128 CROSS 94 130 CUSTA SYSTEMS 463 131 CUSTOM COMP. TECH. 453 132 CYBERNETICS INC. 73 133 CYCLONE SOFTWARE 490 136 DATA SOURCE SYS.CORP. 120 136 DATA ACCUSISTIONS SYS. 85 137 DAMAN 480 138 DATA ACQUISITIONS SYS. 85 139 DATA BASED SOLUTIONS 140 139 DATA ACQUISITIONS SYS. 85 130 DATA ACQUISITIONS SYS. 85 131 DATA SOURCE SYS.CORP. 405 142 DATASMITH 388 143 DATA SOURCE SYS.CORP. 405 144 DATA SOURCE SYS.CORP. 405 145 DATA SOURCE SYS.CORP. 199 146 DIGITAL IDMENSIONS 148 147 DIGITAL RESEARCH 49 148 DIGITAL RESEARCH 49 149 DIGITAL RESEARCH 311 150 DIGITAL INMENSIONS 148 151 DIGITAL RESEARCH 311 152 DIGITAL RESEARCH 311 153 DIALA SYS.CONTROL CORP. 175 154 DIGITAL RESEARCH 311 155 DIGITAL RESEARCH 311 156 DIGITAL RESEARCH 311 157 DIGITAL RESEARCH 311 158 DIGITAL RESEARCH 311 159 DIGITAL RESEARCH 311 150 DIGITAL RESEARCH 311 150 DIGITAL RESEARCH 311 150 DIGITAL RESEARCH 311 151 DIGITAL RESEARCH 311 152 DIGAT ACOUNTROL CORP. 155 154 DISCOUNT SOFTWARE 177 155 DISCOUNT SOFTWARE 177 150 DIALA SYS.CONTROL CORP. 155 151 DOW JONES SOFTWARE 177 150 DIALA SYS.CONTROL CORP. 156 151 DOW JONES SOFTWARE 177 150 DIALA SYS.CONTROL CORP. 156 151 DOW JONES SOFTWARE 177 150 DIALA SYS.CONTROL CORP. 151 151 DOW JONES SOFTWARE 177 150 DIALA SYS.CONTROL CORP. 156 151 DOW JONES SOFTWARE 177 150 DIALA SYS.CONTROL CORP. 151 161 EMERGY AIR FREIGHT 321 162 EMS. 230 1 | 66 7 6 4 4 4 9 9 |
| 268 EXTENDED PROCESSING 492<br>463 FINER PROGRAM 460<br>174 FORMULA INT'L. 407                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |

| 1 | Inq                                                                                                                 | uiry No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Page No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | 1756<br>1776<br>1776<br>1777<br>1780<br>1811<br>1824<br>1831<br>1831<br>1831<br>1831<br>1831<br>1831<br>1831<br>183 | FOXAKIONE SOLUCIONE SOLUCI | (SYSTEMS 496 3ELLER INC. 307 LIN COMP. CORP. 125 0 480 MPUTER SYS. 484 N OF EDEN COMP. 494 AL SOFTWARE INC. 375 20MPUTER CORP. 66, 67 AR REI 460 LD COMP. SYS. 275 INIX,INC. 480 STER COMP. SYS. 275 INIX,INC. 480 STER COMP. BUS C 486 NC. 50 FTWARE BROKERS 436 VELL CORP. 463 R & ROW 356 N BOOK CO. 363 R & ROW 356 N BOOK CO. 363 R & ROW 356 N BOOK CO. 363 ITHUMENTS, INC. 116, 117 RPORATION 357 TT-PACKARD 344, 345 I HOTEL CORP. 319 AN COMP. PROD. 841 SYS.SOFTWARE 496 I SOFT 385 12 IRP. 312, 313 TRIUMENTS, INC. 116, 117 RPORATION 357 TERNATIONAL 185 M 445 M 445 TENTERPRISES 490 ITE. SCTF. ANALYSIS 478 HAND 278 IGENT ARTEFACTS 411 CTIVE STRUCT. 247 EC DATA SYS. 11 T'L. 126 DES 109 OMP. PROD. 501 OMP. PROD. 503 OFLECTR. 508, 509 CRODEVICES 514, 515 CRODE |

MICRO PRO INT'L. 174, 175 MICRO SCI 93 MICRO WEST 417 MICRO WORKS, THE 206 MICROCOMP.BUSN.IND. 222, 223 MICRODYNAMICS 488 266 267 269 MICHOCOMP. BUSN.IND. 222, 223
MICRODYNAMICS 488
MICROPANAMICS 488
MICROPERIPH.CORP.THE 488
MICROPROCESSORS UNLTD. 496
MICROSOFT 263
MICROSTUF, INC. 287
MICROSTUF, INC. 287
MICROWARE 488
MILLER MICROCOMP.SERV. 288
MINI MICRO MART 219
MINI MICRO MART 234
MINI MICRO MART 234
MINI MICRO MART 234
MINI MICRO MART 483
MINOLTA CORP. 353
MK RESEARCH 490
MONARCHY ENG.INC. 478
MONITOR DYNAMICS 486
MONITOR DYNAMICS 486
MONROE SYS.FOR BUSN. 397
MOORE BUSN.FORMS 362
MOUNTAIN VIEW PRESS 389 273 274 275 276 277 279 280 281 282 283 284 285 286 288 290 291 292 293 294 MOUNTAIN VIEW PRESS 389 MPI 15 MUSYS 44 MUSYS 44
NEBS 437
NEC HOME ELECTR.USA 153
NEC INFORMATION SYS. 63
NEC INFORMATION SYS. 76,
77, 78, 79
NEC INFORMATION SYS. 225 295 300 NET INFORMATION 515. 225 NETRONICS 497 NETWORK CONSULTING CORP. 166 NORTH HILLS CORP. 482 NORTH HILLS CORP. 492 NORTHWEST INSTR.SYS. 215 NOVATION 270 301 302 303 304 NOVATION 270 NOVATION 271 NRI SCHOOLS ELECTR. DIV. 401 OASIS SYSTEMS 338 OKIDATA CORP. 213 OMEGA SALES CO. 253 OPTRONICS TECH 86 ORANGE MICRO 165 ORANGE MICRO 187 305 306 307 308 309 310 310 ORÂNGE MICRO 187
311 ORGANIZATIONAL MANAGEMENT SYS. 486
312 ORTHOCODE GROUP 58
313 ORYX SOFTWARE 365
OWENS ASSOC. 18
316 P.R.I.C.E. 484
317 PACIFIC COMP. 306
318 PACIFIC EXCHANGES 462, 478, 482, 486, 488, 490, 494
326 PALOMAR COMP.EQUIP. 518, 519
327 PAN AMERICAN ELEC. INC. 413
328 PANASONIC H.H.C. 144, 145
PEEK 478 PEEK 478
PERCOM DATA 7
PERIPHERAL MARKETING INC. 492
PERIPHERALS UNLTD. 346 330 PERIPHERALS UNLTD. 346
PERSONAL COMP.SYS. 335
PERSONAL COMPUTER AGE 246
PERSONAL SYS.TECHN. 45
PHASER 161
PICKLES & TROUT 196
PION INC. 216
POPCOM 230
PRACTICAL PERIPH. 22, 23
PRINCETON GRAPHIC SYS. 135
PRIORITY ONE 217
PRIORITY ONE 520, 521, 522, 523,524
PROFESSIONAL DATA SYS. 285
PROFESSIONAL DATA SYS. 322
PROGRAMMERS SFTW. EX. 8
PURCHASING AGENT, THE 160 332 333 334 335 336 337 338 339 340 479 PIOGRAMMERS 37 W. EA. 8
PURCHASING AGENT, THE 160
Q.T./GOLDEN WEST 267
QUADRAM CORP. 269
QUADRAM CORP. 269
QUADRAM CORP. 280, 281
QUASAR DATA PROD.INC. 121
QUBIE DISTRIBUTORS 59
QUBIE DISTRIBUTORS 295
QUEST ELECTR. 485
QUEST ELECTR. 485
QUEST RESEARCH INC. 482
QUME CORP. 98, 99
R.C.ELECTRONICS 198
RACET COMPUTES LTD. 421
RADIO SHACK CIV
RANA SYSTEMS 30, 31
RCA 141
RCA SOLID STATE 87
RCS INC. 394 350 PURCHASING AGENT. THE 160 525 352 353 354 356 442 443 357 358 359 361 362 364 365 366 367 RČA SÖLID STATE 87
RCS INC. 394
RED BARON COMP.PROD. 156, 157
RICKERDATA 462
R.K.S. INC. 439
ROKLAN SOFTWARE 32
RTL PROGRAMMING AIDS 494
SC DIGITAL 210
S&W COMPUTER SUPPLY 492
S-100 INC. 440
SAGE COMP.TECH. 75
SANDHU MACHINE DESN. 467
SATURN SYSTEMS INC. 159
SCION CORP 5 370 363 363 458 371 372 373 374 375 376 377 453

Inquiry No.

Page No.

To get further information on the products advertised in BYTE, fill out the reader service card with your name and address. Then circle the appropriate numbers for the advertisers you select from the list. Add a 20-cent stamp to the card, then drop it in the mail. Not only do you gain information, but our advertisers are encouraged to use the marketplace provided by BYTE. This helps us bring you a bigger BYTE. The index is provided as an additional service by the publisher, who assumes no liability for errors or omissions. \*Correspond directly with company.

# Page No. Inquiry No. SCION CORP 5 SCOTIA SOFTWARE 100 SCOTTSDALE SYSTEMS 315 S D SYSTEMS 208, 209 SECTOR SYSTEMS 490 SEIKOSHA CORP. 151 SIERRA DATA SCIENCES 29 SIERRA DATA SCIENCES 323 SIGEN CORP. 244 SIGEN CORP. 244 SLR 494 SLUDER 429 SOFTCORP INT'L. 92 SOFTTECH MICROSYS. 191 SOFTULEST 294 SOFTWARE BANC 83 SOFTWARE MANAGEMENT GROUP INC. 459 SOFTWARE PUBLISHERS 461 SOFTWARE TECHNIQUE 484 SOLID STATE SALES 362 SONICS MICRO SYS. 351 SOURCE EDP 324, 325

| Inqu                                                                                                         | iry No.                    | Page No.                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 394<br>395<br>396<br>397<br>398<br>399<br>400<br>401<br>403<br>404<br>405<br>406<br>408<br>409<br>410<br>411 | TECH-DATA C<br>TECH-DATA C | POORS 274<br>D. 298<br>TR. CORP. 20<br>498<br>487<br>63<br>4<br>ECH. 106<br>CTR. 237<br>496<br>ESS FORMS 462<br>ORP. 480<br>ORP. 480<br>'S.CONSLTNS. 243<br>115<br>-, 494<br>IC. 27<br>STEMS 310 |

| Inqu                                                                             | iry No.                                                                                                                                                           | Page No.                                                                                                                                                                       |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 413<br>414<br>415<br>416<br>417<br>151<br>418<br>419<br>466<br>420<br>422<br>423 | TEXAS COM<br>TEXPRINT 1<br>THINKER'S:<br>TIMESHARII<br>TOSHIBA AI<br>TRAKSTOR<br>TRISTAR DA<br>TSK ELECTI<br>U.S. EXCHA<br>U.S. MICRO<br>U.S. ROBOT<br>UNIFIED SO | P.SYS. 245<br>26<br>SOFT INC. 110<br>NG DEV. INC. 292<br>132<br>MERICA INC. 361<br>381<br>TA SYS. 304<br>N.CORP. 279<br>NGE 461<br>SALES 504, 505<br>CS 104<br>FTWARE SYS. 488 |
| 424<br>426                                                                       | VECTOR ELI<br>VECTRIX 289<br>VERBATIM (                                                                                                                           | 9                                                                                                                                                                              |
| 427                                                                              | VIDEX 21<br>VISICORP IN                                                                                                                                           | IC. 273                                                                                                                                                                        |
| 428<br>429<br>431                                                                | VISUAL TEC<br>VOTRAX 424<br>VYNET COR                                                                                                                             |                                                                                                                                                                                |

432 WASHINGTON COMP.SERV. 438

SYS. 488

WASHINGTON COMP.SERV. 489
WESTICO INC. 239
WESTINGHOUSE/LGHTNG DIV. 403
WESTINGHOUSE ELECTR.CORP.
INSERT 64A
WHOLESALE SUPPLIERS 480
WILD HARE COMP.SYS. 355
WIN/MILL RESEARCH INC. 490
WINTEK CORP. 486
WINTERHALTER & ASSOC. 429
WORDTECH SYSTEMS 453
X COMP. 61 X COMP 61 XEROX EDUCATION PUBL. 95 YANG ELECTRONIC 490 YANG ELECTRONIC 492

Page No.

Inquiry No.

\*Correspond directly with company.

# National Advertising Sales Representatives:

Northeast (617) 444-3946 ME, NH, VT, MA, CT, RI, DE, MD, VA, WV, OK, TX, Upstate NY, Eastern Canada Halar Associates 280 Hillside Ave.

Mid Atlantic (201) 741-7744 NY, NYC, NJ, PA Hajar Associates 321 Broad St. Red Bank, NJ 07701

Needham Heights, MA 02194

Southeast (305) 628-3525 NC, SC, GA, FL, AL, MS, TN, KY, LA Hajar Associates Diplomat Bldg. 5400 Diplomat Circle Sulte 205

Orlando, FL 32810

Skokle, IL 60076

Midwest (312) 966-0160 MN, WI, MI, IA, IL, IN, OH, MO, NE, KS, ND, SD, AR Hajar Associates 5225 Old Orchard Rd. Sulte 50

Northwest (415) 964-0706 AK, HI, WA, OR, ID, MT, WY, Northern California, Nevada Except Las Vegas, Western Canada Hajar Associates 1000 Elwell Ct. Sulte 124 Palo Alto, CA 94303

Southwest (714) 540-3554 UT, CO, AZ, NM, Las Vegas, Southern California Hajar Associates 3303 Harbor Blvd. Sulte H-4A Costa Mesa, CA 92626

# **European Advertising Sales Representatives:**

Mrs. Maria Sarmiento Pedro Telxelra 8, Off. 320 Iberla Mart 1 Madrid 4, Spain 45 52 891

Mr. Andrew Karnig Andrew Karnig & Associates Kungsholmsgatan 10 112 27 Stockholm, Sweden 08 51 68 70

Mr. Hans Csokor Publimedia Relsnerstrasse 61 A-1037 Vlenna, Austria

Mrs. Gurlt Gepner McGraw-Hill Publishing Co. 115 Yosephtal St. Bat Yam, Israel 866 561 321 39

Mr. Fritz Krusebecker McGraw-Hill Publishing Co. Liebigstrasse 27C D-6000 Frankfurt/Main 1 West Germany 72 01 81

Mr. Michael Sales McGraw-Hill Publishing Co. 17 rue Georges Bizet F 75116 Paris France 720 33 42

Mr. Simon Smith McGraw-Hill Publishing Co. 34 Dover St. London W1X 3RA England 01 493 1451

Mr. Ello Gonzaga McGraw-Hill Publishing Co. Via Baracchini 1 20123 Milan, Italy 86 90 617

Far East/Pacific

Seavex Ltd. 05-49/50 Tanglin Shopping Center 19 Tanglin Rd. Singapore 1024 Republic of Singapore

Seavex, Ltd. Room 102, Yu Yuet Lal Bldg. 43-55 Wyndham St. Central Hong Kong

For fastest service transfer mailer label from wrapper to coupon provided at the right. Requests cannot be honored unless zip code is given. This card valid for 90 days only. **NOTE**—If label is missing or defaced fill out coupon carefully—**PLEASE PRINT**—this is the only way to get requested material to you.

| Name    |           | _ |
|---------|-----------|---|
| (Title) | (Company) | _ |
| Address |           | _ |
| City    | StateZip  |   |

| 1 2  | 1 4  | 41 | 61 | 81  | 101 | 121 | 141 | 161 | 181 | 201 | 221 | 241 | 261 | 281 | 301 | 321 | 341 | 361 | 381 | 401 | 421 | 441 | 461 | 481 | 501 | 521 | 541 | 561 | 581 | 601 | 621 | 641 | 661 | 681 |
|------|------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2 2  | 2 4  | 12 | 62 | 82  | 102 | 122 | 142 | 162 | 182 | 202 | 222 | 242 | 262 | 282 | 302 | 322 | 342 | 362 | 382 | 402 | 422 | 442 | 462 | 482 | 502 | 522 | 542 | 562 | 582 | 602 | 622 | 642 | 662 | 682 |
| 3 2  | 3 4  | 43 | 63 | 83  | 103 | 123 | 143 | 163 | 183 | 203 | 223 | 243 | 263 | 283 | 303 | 323 | 343 | 363 | 383 | 403 | 423 | 443 | 463 | 483 | 503 | 523 | 543 | 563 | 583 | 603 | 623 | 643 | 663 | 683 |
| 4 2  | 24 4 | 44 | 64 | 84  | 104 | 124 | 144 | 164 | 184 | 204 | 224 | 244 | 264 | 284 | 304 | 324 | 344 | 364 | 384 | 404 | 424 | 444 | 464 | 484 | 504 | 524 | 544 | 564 | 584 | 604 | 624 | 644 | 664 | 684 |
| 5 2  | 25 4 | 45 | 65 | 85  | 105 | 125 | 145 | 165 | 185 | 205 | 225 | 245 | 265 | 285 | 305 | 325 | 345 | 365 | 385 | 405 | 425 | 445 | 465 | 485 | 505 | 525 | 545 | 565 | 585 | 605 | 625 | 645 | 665 | 685 |
| 6 2  | 26 4 | 46 | 66 | 86  | 106 | 126 | 146 | 166 | 186 | 206 | 226 | 246 | 266 | 286 | 306 | 326 | 346 | 366 | 386 | 406 | 426 | 446 | 466 | 486 | 506 | 526 | 546 | 566 | 586 | 606 | 626 | 646 | 666 | 686 |
| 7 2  | 27 4 | 47 | 67 | 87  | 107 | 127 | 147 | 167 | 187 | 207 | 227 | 247 | 267 | 287 | 307 | 327 | 347 | 367 | 387 | 407 | 427 | 447 | 467 | 487 | 507 | 527 | 547 | 567 | 587 | 607 | 627 | 647 | 667 | 687 |
| 8 2  | 28 4 | 48 | 68 | 88  | 108 | 128 | 148 | 168 | 188 | 208 | 228 | 248 | 268 | 288 | 308 | 328 | 348 | 368 | 388 | 408 | 428 | 448 | 468 | 488 | 508 | 528 | 548 | 568 | 588 | 608 | 628 | 648 | 668 | 688 |
| 9 2  | 29 4 | 49 | 69 | 89  | 109 | 129 | 149 | 169 | 189 | 209 | 229 | 249 | 269 | 289 | 309 | 329 | 349 | 369 | 389 | 409 | 429 | 449 | 469 | 489 | 509 | 529 | 549 | 569 | 589 | 609 | 629 | 649 | 669 | 689 |
| 10 3 | 30 9 | 50 | 70 | 90  | 110 | 130 | 150 | 170 | 190 | 210 | 230 | 250 | 270 | 290 | 310 | 330 | 350 | 370 | 390 | 410 | 430 | 450 | 470 | 490 | 510 | 530 | 550 | 570 | 590 | 610 | 630 | 650 | 670 | 690 |
| 11 3 | 31 ! | 51 | 71 | 91  | 111 | 131 | 151 | 171 | 191 | 211 | 231 | 251 | 271 | 291 | 311 | 331 | 351 | 371 | 391 | 411 | 431 | 451 | 471 | 491 | 511 | 531 | 551 | 571 | 591 | 611 | 631 | 651 | 671 | 691 |
| 12 3 | 32 ! | 52 | 72 | 92  | 112 | 132 | 152 | 172 | 192 | 212 | 232 | 252 | 272 | 292 | 312 | 332 | 352 | 372 | 392 | 412 | 432 | 452 | 472 | 492 | 512 | 532 | 552 | 572 | 592 | 612 | 632 | 652 | 672 | 692 |
| 13 3 | 33 ! | 53 | 73 | 93  | 113 | 133 | 153 | 173 | 193 | 213 | 233 | 253 | 273 | 293 | 313 | 333 | 353 | 373 | 393 | 413 | 433 | 453 | 473 | 493 | 513 | 533 | 553 | 573 | 593 | 613 | 633 | 653 | 673 | 693 |
| 14 3 | 34 5 | 54 | 74 | 94  | 114 | 134 | 154 | 174 | 194 | 214 | 234 | 254 | 274 | 294 | 314 | 334 | 354 | 374 | 394 | 414 | 434 | 454 | 474 | 494 | 514 | 534 | 554 | 574 | 594 | 614 | 634 | 654 | 674 | 694 |
| 15 3 | 35 9 | 55 | 75 | 95  | 115 | 135 | 155 | 175 | 195 | 215 | 235 | 255 | 275 | 295 | 315 | 335 | 355 | 375 | 395 | 415 | 435 | 455 | 475 | 495 | 515 | 535 | 555 | 575 | 595 | 615 | 635 | 655 | 675 | 695 |
| 16 3 | 36 5 | 56 | 76 | 96  | 116 | 136 | 156 | 176 | 196 | 216 | 236 | 256 | 276 | 296 | 316 | 336 | 356 | 376 | 396 | 416 | 436 | 456 | 476 | 496 | 516 | 536 | 556 | 576 | 596 | 616 | 636 | 656 | 676 | 696 |
| 17 3 | 37 9 | 57 | 77 | 97  | 117 | 137 | 157 | 177 | 197 | 217 | 237 | 257 | 277 | 297 | 317 | 337 | 357 | 377 | 397 | 417 | 437 | 457 | 477 | 497 | 517 | 537 | 557 | 577 | 597 | 617 | 637 | 657 | 677 | 697 |
| 18 3 | 88   | 58 | 78 | 98  | 118 | 138 | 158 | 178 | 198 | 218 | 238 | 258 | 278 | 298 | 318 | 338 | 358 | 378 | 398 | 418 | 438 | 458 | 478 | 498 | 518 | 538 | 558 | 578 | 598 | 618 | 638 | 658 | 678 | 698 |
| 19 3 | 39 ! | 59 | 79 | 99  | 119 | 139 | 159 | 179 | 199 | 219 | 239 | 259 | 279 | 299 | 319 | 339 | 359 | 379 | 399 | 419 | 439 | 459 | 479 | 499 | 519 | 539 | 559 | 579 | 599 | 619 | 639 | 659 | 679 | 699 |
| 20 4 | 10 ( | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 | 340 | 360 | 380 | 400 | 420 | 440 | 460 | 480 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 | 680 | 700 |
|      |      |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

**BYTE'S BOMB** is your direct line to the editor's desk. Each month, the authors of the two top-rated articles receive bonuses based on your evaluation. First look at the list of this month's articles and corresponding article numbers (located in the unclassified ads section on the page preceding the Reader Service list), then rate each article you've read as **Excellent, Good, Fair,** or **Poor**, based on your overall impression of the article, by circling the appropriate number in each column below. Your feedback helps to produce the best possible magazine each month.

| Article No. | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Excellent   | 801 | 805 | 809 | 813 | 817 | 821 | 825 | 829 | 833 | 837 | 841 | 845 | 849 | 853 | 857 | 861 | 865 | 869 | 873 | 877 | 881 | 885 | 889 | 893 | 897 |
| Good        | 802 | 806 | 810 | 814 | 818 | 822 | 826 | 830 | 834 | 838 | 842 | 846 | 850 | 854 | 858 | 862 | 866 | 870 | 874 | 878 | 882 | 886 | 890 | 894 | 898 |
| Fair        | 803 | 807 | 811 | 815 | 819 | 823 | 827 | 831 | 835 | 839 | 843 | 847 | 851 | 855 | 859 | 863 | 867 | 871 | 875 | 879 | 883 | 887 | 891 | 895 | 899 |
| Poor        | 804 | 808 | 812 | 816 | 820 | 824 | 828 | 832 | 836 | 840 | 844 | 848 | 852 | 856 | 860 | 864 | 868 | 872 | 876 | 880 | 884 | 888 | 892 | 896 | 900 |
| Comments    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

# **EUTE** READER SERVICE



For fastest service transfer mailer label from wrapper to coupon provided at the right. Requests cannot be honored unless zip code is given. This card valid for 90 days only. **NOTE**—If label is missing or defaced fill out coupon carefully—**PLEASE PRINT**—this is the only way to get requested material to you.

| Name    |           | 4125 |
|---------|-----------|------|
| (Title) | (Company) |      |
| Address |           |      |
| City    | State Zip |      |

FEBRUARY 1983

| 1 2  | 1 41 | 61   | 81  | 101 | 121 | 141 | 161 | 181 | 201 | 221 | 241 | 261 | 281 | 301 | 321 | 341 | 361 | 381 | 401 | 421 | 441 | 461 | 481 | 501 | 521 | 541 | 561 | 581 | 601 | 621 | 641 | 661 | 68  |
|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2 2  | 2 42 | 2 62 | 82  | 102 | 122 | 142 | 162 | 182 | 202 | 222 | 242 | 262 | 282 | 302 | 322 | 342 | 362 | 382 | 402 | 422 | 442 | 462 | 482 | 502 | 522 | 542 | 562 | 582 | 602 | 622 | 642 | 662 | 682 |
| 3 2  | 3 43 | 3 63 | 83  | 103 | 123 | 143 | 163 | 183 | 203 | 223 | 243 | 263 | 283 | 303 | 323 | 343 | 363 | 383 | 403 | 423 | 443 | 463 | 483 | 503 | 523 | 543 | 563 | 583 | 603 | 623 | 643 | 663 | 683 |
| 4 2  | 4 44 | 1 64 | 84  | 104 | 124 | 144 | 164 | 184 | 204 | 224 | 244 | 264 | 284 | 304 | 324 | 344 | 364 | 384 | 404 | 424 | 444 | 464 | 484 | 504 | 524 | 544 | 564 | 584 | 604 | 624 | 644 | 664 | 684 |
| 5 2  | 5 4! | 5 65 | 85  | 105 | 125 | 145 | 165 | 185 | 205 | 225 | 245 | 265 | 285 | 305 | 325 | 345 | 365 | 385 | 405 | 425 | 445 | 465 | 485 | 505 | 525 | 545 | 565 | 585 | 605 | 625 | 645 | 665 | 688 |
| 6 2  | 6 46 | 66   | 86  | 106 | 126 | 146 | 166 | 186 | 206 | 226 | 246 | 266 | 286 | 306 | 326 | 346 | 366 | 386 | 406 | 426 | 446 | 466 | 486 | 506 | 526 | 546 | 566 | 586 | 606 | 626 | 646 | 666 | 686 |
| 7 2  | 7 47 | 7 67 | 87  | 107 | 127 | 147 | 167 | 187 | 207 | 227 | 247 | 267 | 287 | 307 | 327 | 347 | 367 | 387 | 407 | 427 | 447 | 467 | 487 | 507 | 527 | 547 | 567 | 587 | 607 | 627 | 647 | 667 | 687 |
| 8 2  | 8 48 | 8 68 | 88  | 108 | 128 | 148 | 168 | 188 | 208 | 228 | 248 | 268 | 288 | 308 | 328 | 348 | 368 | 388 | 408 | 428 | 448 | 468 | 488 | 508 | 528 | 548 | 568 | 588 | 608 | 628 | 648 | 668 | 688 |
| 9 2  | 9 49 | 69   | 89  | 109 | 129 | 149 | 169 | 189 | 209 | 229 | 249 | 269 | 289 | 309 | 329 | 349 | 369 | 389 | 409 | 429 | 449 | 469 | 489 | 509 | 529 | 549 | 569 | 589 | 609 | 629 | 649 | 669 | 689 |
| 10 3 | 0 50 | 70   | 90  | 110 | 130 | 150 | 170 | 190 | 210 | 230 | 250 | 270 | 290 | 310 | 330 | 350 | 370 | 390 | 410 | 430 | 450 | 470 | 490 | 510 | 530 | 550 | 570 | 590 | 610 | 630 | 650 | 670 | 690 |
| 11 3 | 1 51 | 71   | 91  | 111 | 131 | 151 | 171 | 191 | 211 | 231 | 251 | 271 | 291 | 311 | 331 | 351 | 371 | 391 | 411 | 431 | 451 | 471 | 491 | 511 | 531 | 551 | 571 | 591 | 611 | 631 | 651 | 671 | 69  |
| 12 3 | 2 52 | 2 72 | 92  | 112 | 132 | 152 | 172 | 192 | 212 | 232 | 252 | 272 | 292 | 312 | 332 | 352 | 372 | 392 | 412 | 432 | 452 | 472 | 492 | 512 | 532 | 552 | 572 | 592 | 612 | 632 | 652 | 672 | 692 |
| 13 3 | 3 5  | 3 73 | 93  | 113 | 133 | 153 | 173 | 193 | 213 | 233 | 253 | 273 | 293 | 313 | 333 | 353 | 373 | 393 | 413 | 433 | 453 | 473 | 493 | 513 | 533 | 553 | 573 | 593 | 613 | 633 | 653 | 673 | 69  |
| 14 3 | 4 5  | 4 74 | 94  | 114 | 134 | 154 | 174 | 194 | 214 | 234 | 254 | 274 | 294 | 314 | 334 | 354 | 374 | 394 | 414 | 434 | 454 | 474 | 494 | 514 | 534 | 554 | 574 | 594 | 614 | 634 | 654 | 674 | 69  |
| 15 3 | 5 5! | 5 75 | 95  | 115 | 135 | 155 | 175 | 195 | 215 | 235 | 255 | 275 | 295 | 315 | 335 | 355 | 375 | 395 | 415 | 435 | 455 | 475 | 495 | 515 | 535 | 555 | 575 | 595 | 615 | 635 | 655 | 675 | 69  |
| 16 3 | 6 50 | 6 76 | 96  | 116 | 136 | 156 | 176 | 196 | 216 | 236 | 256 | 276 | 296 | 316 | 336 | 356 | 376 | 396 | 416 | 436 | 456 | 476 | 496 | 516 | 536 | 556 | 576 | 596 | 616 | 636 | 656 | 676 | 69  |
| 17 3 | 7 5  | 7 77 | 97  | 117 | 137 | 157 | 177 | 197 | 217 | 237 | 257 | 277 | 297 | 317 | 337 | 357 | 377 | 397 | 417 | 437 | 457 | 477 | 497 | 517 | 537 | 557 | 577 | 597 | 617 | 637 | 657 | 677 | 697 |
| 18 3 | 8 5  | 8 78 | 98  | 118 | 138 | 158 | 178 | 198 | 218 | 238 | 258 | 278 | 298 | 318 | 338 | 358 | 378 | 398 | 418 | 438 | 458 | 478 | 498 | 518 | 538 | 558 | 578 | 598 | 618 | 638 | 658 | 678 | 69  |
| 19 3 | 9 5  | 9 79 | 99  | 119 | 139 | 159 | 179 | 199 | 219 | 239 | 259 | 279 | 299 | 319 | 339 | 359 | 379 | 399 | 419 | 439 | 459 | 479 | 499 | 519 | 539 | 559 | 579 | 599 | 619 | 639 | 659 | 679 | 69  |
| 20 4 | 0 6  | 08 0 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 | 340 | 360 | 380 | 400 | 420 | 440 | 460 | 480 | 500 | 520 | 540 | 560 | 580 | 600 | 620 | 640 | 660 | 680 | 70  |

To get further information on the products advertised in BYTE, fill out the reader service card with your name and address. Then circle the appropriate numbers for the advertisers you select from the list. Add a 20-cent stamp to the card, then drop it in the mail. Not only do you gain information, but our advertisers are encouraged to use the marketplace provided by BYTE. This helps us bring you a bigger BYTE. The index is provided as an additional service by the publisher, who assumes no liability for errors or omissions.



PLACE STAMP HERE

READER SERVICE PO BOX 298 DALTON, MA 01226 USA

| SUBSCRIPTIONS IN                                       |      |                                                            | USA                                    | Canada<br>Mexico |
|--------------------------------------------------------|------|------------------------------------------------------------|----------------------------------------|------------------|
| 20B2CKILLIOM2 I:III                                    |      | ☐ 1 year                                                   | □ \$21                                 | □ \$23           |
|                                                        |      | ☐ 2 years                                                  | □ \$38                                 | □ \$42           |
|                                                        | 4123 | □ 3 years                                                  | □ \$55                                 | □ \$61           |
| For a subscription to BYTE, please complete this card. |      |                                                            |                                        |                  |
| Name                                                   |      | □ \$37 Elsewh                                              | (air delivery) payn<br>nere (surface m |                  |
| Address                                                |      | enclosed<br>(Air mail rat                                  | es available upon                      | request)         |
| City                                                   |      | Please remit in US funds drawn on a<br>US bank. Thank you. |                                        |                  |
| State Zip Country                                      |      |                                                            |                                        |                  |
| Card No                                                |      | ☐ Check enclo                                              | sed (Bonus: [N                         | orth America     |

Please allow eight weeks for processing. Thank you.

Four digits above name—Master Charge only \_\_\_\_\_

Expiration date \_

| RUTF          |  |
|---------------|--|
| SUBSCRIPTIONS |  |

Please allow eight weeks for processing. Thank you.

| CURCOURTIONS SUM                                       |       | Mexico                                        |                  |                  |  |
|--------------------------------------------------------|-------|-----------------------------------------------|------------------|------------------|--|
| SUBSCRIPTIONS A                                        |       | □ 1 year                                      | □ \$21           | □ \$23           |  |
|                                                        |       | ☐ 2 years                                     | □ \$38           | □ \$42           |  |
| For a subscription to BYTE, please complete this card. | 4123  | ☐ 3 years                                     | □ \$55           | □ \$61           |  |
| Nama                                                   |       | ☐ \$53 Europe (air delivery) payment enclosed |                  |                  |  |
| Name                                                   |       | □ \$37 Elsewh                                 | nere (surface i  | mail) payment    |  |
| Address                                                |       | enclosed                                      |                  |                  |  |
|                                                        |       | (Air mail rai                                 | tes available up | on request)      |  |
| City                                                   |       | Please rem                                    | it in US funds d | rawn on a        |  |
| State Zip Country                                      |       | US                                            | bank. Thank yo   | ou.              |  |
| Card No                                                |       | ☐ Check enclo                                 |                  |                  |  |
| Expiration date                                        |       | only] one EXTF                                |                  | the price of 12) |  |
| Four digits above name—Master Charge only              | - 100 | meder - darg                                  | VISA*            |                  |  |
|                                                        |       |                                               |                  |                  |  |

Note our special offer!

Note our special offer!

Send cash with your order

Send cash with your order with your o and receive 13 15 mes

and receive 13 15 mes

for the price of 12 for

for the price of 12 for

each year you subscribe.

each year you subscribe.

Chorth America only Please.

Your do-

Each month BYTE will bring you the latest in microcomputer technology.

DISCOVER and IMPLEMENT new ideas. Don't miss the original information presented in the pages of BYTE.

With BYTE you'll always be among the first to know about the important breakthroughs, worthwhile new equipment, and innovative projects in the world of computing.

only] one EXTRA issue—receive 13 issues for

USA

Date \_\_\_\_\_ Bill me (North America only)

the price of 12)

Canada

CHALLENGE US to deliver the very best ideas in microcomputers and advanced technology to you. Return the attached card todayl

Subscribe to BYTE—the world's leading computer magazine.

PLACE STAMP HERE



PLACE STAMP HERE



# THE LEADING EDGE IN PRINTERS

# ONE GREAT LINE. ONE GREAT WARRANTY.

Finally, there's one full family of printers that covers every business or word processing application—all from C. Itoh, a company known for packing more product into less price; and all distributed exclusively by Leading Edge, a company known for searching out and providing that very thing. Which means that one call to one source can get you any printer, any time you need it, for any purpose. All backed by a full years' warranty from Leading Edge. (Try that on any other line of printers.)

# THE PRO'S.

The Prowriters: business printers—and more. The "more" is a dot-matrix process with more dots. It gives you denser, correspondence quality copy (as opposed to business quality copy, which looks like a bad job of spray-painting).

Prowriter: 120 cps. 80 columns dot matrix compressable to 136. 10" carriage. Parallel or serial interface.

Prowriter 2: Same as Prowriter, except 15" carriage allows full 136 columns in normal print mode.

Parallel or serial interface.



# THE STAR

The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing.

It plugs into almost any micro on the market, serial or parallel.



# THE MASTER.

The Printmaster F-10. Does all the same good stuff as the Starwriter except, at 55 cps, the Master does it faster.



Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021. Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

Circle 229 on inquiry card

# Sale! Radio Shack Color Computer Disk Drives Now Cut 25%



If you think your Extended BASIC TRS-80® Color Computer is a great little computer (and everybody who owns one does!), just wait until you add one or more disk drives to it.

These 35-track, 51/4" double-density drives will give you the high-level performance you want from your Color Computer. Each drive puts over 156K of on-line data and program storage right at your fingertips. And you can chain up to four drives together for a total of more than 626K.

Yet all that extra storage is available at an access speed that you just can't get from a cassette recorder—a seek time of 30 milliseconds (track to track) and a data transfer rate of 250 bits per second.

Best of all, our Color Disk Drives are easy to install. Just plug the controller Program Pak™ into your ROM port and you're all set. It uses only about 2K of RAM, too. And you can upgrade your TRS-80 Standard Color Computer to use disk drives with our Extended Basic ROM Kit (26-3018, \$99, plus installation charge).

# **New Low Prices on Color Computers!**

# All Are \$100 Less Than Last Year!

16K Standard BASIC Color Computer (26-3004). Now only \$299.95.

16K Extended BASIC Color Computer (26-3002). Now only \$399.95.

32K Extended BASIC Color Computer (26-3002). Now only \$549.95.

See the complete line of TRS-80 Color Computers, disk drives, programs and accessories at your nearby Radio Shack Computer Center, store or participating dealer—where complete color disk systems start at only \$848.95. But hurry—this sale ends Feb. 28, 1983.

# Radio Shack

The biggest name in little computers®
A DIVISION OF TANDY CORPORATION

Retail prices may vary at individual stores and dealers. All prices are less TV. Reference pricing from Radio Shack Computer Catalog RSC-8.

Circle 364 on inquiry card.